**Sim City aka**

**Infraempiricism aka**

**Post-normal futures aka**

**Complexity aka**

**Adaptive Resilience aka**

**Sustainability aka**

**Beyond CBA aka**

**Economic (ir)rrationality**

**Brought to you by Carl, Kirk, Cole, Jay, Alex, Jonathan, Austin, Kiran, Zachary, Carson, Tejesh, Hunter, Justin, Madalyn, Josh, Garrigan, Seth, and Matthew**

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# 1NC Post-normal Futures

## 1NC Post-normal Futures-1

**Instead of weighing the plan in a vacuum, evaluate the future locked in by the 1AC.**

**Voting negative imagines transportation policy-making that can adapt to the complex uncertainties they pave over.**

**Navigating the highways of policy requires you to FIRST decide where you want to go—**

**A sustainable future requires a move beyond particular scenarios threatening survival to broader visions of transformation.**

**Inayatullah 2003**

[Sohail Inayatullah, Prof at Tamkang U, “Alternative Futures of Transport” *foresight* 5.1: 34-43] Inayatullah 1

Given the reality of the Los Angelization of South-East Queensland by 2020, with the population by 2021, ``estimated to swell to 3.4 million F F F and [r]apid growth in the state's southeast corner likely to continue unabated for the next 20 years, accounting for more than a quarter of Australia's growth'' 􏰀Heywood, 2002), any attempts to create alternative futures will certainly be appreciated by future generations. But the initial issue is why is the future relevant to issues of urban planning. Certainly, more than perhaps any other investment, a long term focus is crucial for transport. Investing unwisely can lead to economic losses in the billions. Of course, citizens will use whatever transport system is given to them, but issues of efficacy and efficiency have become more crucial. We know that the car-plus-roads system and the worldview that underlies it may be efficient, but when it comes to efficacy ± in terms of criteria such as health 􏰀pollution and road deaths), lost productivity from traffic jams[1], and lost alternatives ± it is far from clear that the path we have travelled, and continue to travel, is the right one. Indeed, what we learn from chaos and complexity theory is that particular, sometimes accidental, decisions lead to lock-in toward particular futures. For example, M. Mitchell Waldrop 􏰀1992) writes in Complexity: The Emerging Science at the Edge of Order and Chaos 􏰀p. 41) that in the contest between the steam engine and the internal combustion engine, an outbreak of hoof and mouth disease ± making water troughs impossible to access ± was among the reasons that the steam engine did not take off. Once the internal combustion engine did take off, an entire system of suppliers, repairers, retailers took off as well. An ecology developed around the transport system. We are in a similar situation, in which we have a lock-in with petrol and the internal combustion engine. Other alternatives have a difficult time in breaking into this foundational lock-in: transport has become a transportation system. Thus, the decisions we make now cannot be seen in isolation. Our travel choices are creating new systems, meanings and values 􏰀conscious and unconscious) around those systems, and indeed the basis for future civilization. Making mistakes ± whether for economic, engineering, environmental or health reasons ± must be taken very seriously. Once a new technology gets locked in, it is difficult to remove. Its lock-in, it is also crucial to remember, may not be based on long-run efficiency. Given the seriousness of the future ± as the saying goes, the future is not for wimps ± we need to look as clearly as possible to the future so that we can make wiser decisions today. Temporal, spatial and worldview distance However, uncertainty increases as we go further out in time and in space as well as person. When we are in the ``now'' 􏰀temporality) in a space 􏰀geography) known to us and with just oneself or near ones 􏰀those who see the world in similar fashions), then there is some degree of certainty. But as we move further from the now to the what-was or to the what-will- be, or from our region to the globe to space and from who we know to who we don't know, uncertainty dramatically increases. The process of globalization has a number of features:  First, it involves not just the globalization of capital but the globalization of ideas as well 􏰀Al-Jazeera versus CNN, for example) and even the hints of the globalization of labour 􏰀irrespective of Australian Minister for Immigration Ruddock's efforts to create a Fortress Australia). As well, we are seeing the globalization of problems 􏰀the planetary environment), and the globalization of governance 􏰀issues related to the governance of and within nation-states and the development of transnational corporations and virtual states such as Al- Qaeda) quite clearly create a new world. Essentially this means that as we move away from now, locale and our person and friends, we move from what we know to what we don't know to what we don't know we don't know 􏰀see Appendix, Table AI). When the world was based on what we knew, it was perhaps easier. Yes ± now going back a few centuries ± the feudal lord pillaged, but there was some security against the barbarians outside; yes, plagues came and went but that was what the gods did with mortal souls. The world was understandable even if life was nasty, brutish and short 􏰀although even here there is debate, with many arguing that there were periods of history where we were at least time- if not material-rich). Quickly moving to 1950s Australia, the USA and other rich nations, we quite clearly knew what we knew. But the feminist movement, the multicultural movement, quantum physics and then postmodernism, indeed, everything ``post'', ruptured holes in the security and safety of truth, reality, nature and sovereignty. And by the time genetics and its claims to the eighth day of evolution came along nature had changed. With heightened risk, we moved to the situation of what we did not know. The response to the problem of risk has been solved, unfortunately, neither by innovation, civilizational dialogue, nor by leadership, but through scenario planning. Again, let us be clear and bestow praise where it should go. Queensland Transport's and Department of Main Road's report on alternative futures of transport titled, Fourseeable Futures,isaremarkableaccomplishment.Thescenarios satisfy an important criterion in that they are distinct from each other 􏰀i.e. not the same old stuff and real divergence between scenarios). ``Carbon crunch'' assumes a world where global warming and other environmental problems make transportation policies based on earlier definitions of oil economics problematic. Oil is far more expensive. It is a strikingly different world from the ``Coastal bloom'' scenario, where Queenslanders and other Australians flock to the seaside and try to develop sustainable communities there. ``Coastal bloom'' differs from the ``Super city'' scenario, in which the entire South-East Queensland area becomes one integrated international city. And this differs from that of ``Global bust'', wherein economic hardships change the nature of development. Strategy can thus be developed based on these alternative futures. Are these forecasts? Of course, scenario planners hide behind their statement that scenarios are not forecasts. Unfortunately, scenarios do become forecasts ± even if we do not intend them to be so ± indeed, they can become competing images of the future, competing possibilities. They are certainly not ``hard' forecasts which can be judged by their accuracy. Rather, they are a map of the future, and can thus be seen as ``soft'' forecasts. But quite rightly so; the real test is not in precision, but in whether more strategic policy making results, that is, whether they are relevant to creating alternative futures. But there is a deeper problem in Fourseeable Futures that is symptomatic of many scenarios' exercises, and this flaw is near catastrophic. There is a claim that scenarios are not preferred futures, but merely analytic constructs. This is fine as it is, but ultimately a statement that can neither inspire nor create a different future. The purpose of the thinking about the future is manifold. It is not just to create better strategy. Of course, we need to move from the jungle of life ± the short term issues of survival ± to strategic rational thinking 􏰀the image of the chess set is most suitable), and then to the broader alternatives, mountain tops, if you will. And this is crucial, mountain tops in this futures landscape[2] are not scenarios but different ways of seeing the world, with different stakeholders. They are authentic alternative futures, not merely scenarios with little variation from each other. But beyond the mountain top is the star. This is the vision of the future. The vision inspires. The vision enables. The vision brings out the best in us. The vision cannot be too far away 􏰀we tire) nor too close 􏰀our skepticism prevails) but temporally just right so that we move forward and create a different future 􏰀or return to a previous future). The landscape of the future comprises: 8 Jungle ± survival ± competition. 8 Chess set ± strategy ± winning. 8 Mountain tops ± big picture ± rethinking. 8 Star ± the dream ± creating. This is the ``vision thing'' that eluded George Bush Sr. But Australian Prime Minister John Howard learned from that experience,andmadetheFaustianbargain:insteadof vision, he has used brilliant tactics, clearly stating that elections are not about the vision 􏰀where Australia would like To go), but about not losing. The politics of morality was traded for the short-term satisfaction of victory. But we shall see. Perhaps history will find that when too much is in flux, it is not the Mandelas that are needed, but the Howards ± those who slow history to a crawl, making us all feel safe, reminding us at the end of the day that it is about roads, rates and rubbish plus safety from foreigners 􏰀global warming or global labour) that is most important. Then again, perhaps history will judge otherwise. As Mao-tse tung commented when asked about the success of the French Revolution:``Itistoosoontotell''. Vision is also about the clarity of image. Certainly in the sensate down-to-earth world of roads and cars, of solving problems of transport, images of the future might seem somewhat fluffy. But it is the image of today that creates the future of tomorrow. I quote extensively from Frederick Polak 􏰀cited in Milojevic, 2002): Many utopian themes, arising in fantasy, find their way to reality. Scientific management, full employment, and social security were all once figments of a utopia-writers' imagination. So were parliamentary democracy, universal suffrage, planning, and the trade union movement. The tremendous concern for child-rearing and universal education, for eugenics, and for garden cities all emanated from the utopia. The utopia stood for the emancipation of women long before the existence of the feminist movement. All the current concepts concerning labor, from the length of the work week to profit-sharing, are found in the utopia. Thanks to the utopianists, the twentieth century did not catch man totally unprepared. And it is crucial to remember that not all images are positive, some can be quite deadly. Ashis Nandy 􏰀1987) reminds us: ``Today's utopias unless resisted are tomorrow's nightmares''. Thus the image of today can create the future of tomorrow.

## 1NC Post-normal Futures-2

**The future is more like a road network than a linear path from A to B to C to D**

**The 1AC paves over the complex interactions between their internal links—But THE WHOLE IS MORE THAN THE SUM OF ITS PARTS—Their false sense of certainty undermines foresight and sustainable planning.**

**Ramalingam et al 2008**

[Ben, Senior Research Associate at the Overseas Development Institute, and Harry jones at ODI, "Exploring the science of complexity" <http://www.odi.org.uk/resources/docs/833.pdf> ] RJ 10

Concept 4: Nonlinearity5 ‘... the darkest corner of science [is] the realm of non-linear problems’ (Strogatz, 2003). Outline of the concept Traditional scientific approaches are based on the idea that linear relationships can be identified through data gathering and analysis, and can be used as the basis of ‘laws’ of behaviour (Byrne, 1998). Such approaches in the physical sciences have informed the development of social, economic and political science, using broad theories of behaviour to generate hypotheses about causal relations between variables of interest (Homer-Dixon, 1995). However, complexity science suggests that human systems do not work in a simple linear fashion. Feedback processes between interconnected elements and dimensions lead to relationships that see change that is dynamic, nonlinear and unpredictable (Stacey, 1996). Nonlinearity is a direct result of the mutual interdependence between dimensions found in complex systems. In such systems, clear causal relations cannot be traced because of multiple influences. The distinction between linear and nonlinearity is far from trivial. If dynamic nonlinear feedbacks in response to rising greenhouse gases are included in the model used in the Stern Review of Climate Change (cited in Concept 2), for example, the total average cost of climate change rises from 5% to at least 20% of global per capita consumption (HM Treasury, 2006).6 Detailed explanation Vast numbers of naturally occurring systems exhibit nonlinearity. As one thinker has dryly suggested (Stanislaw Ulam, in the 1950s), calling a situation nonlinear is like going to the zoo and talking about all the interesting non-elephant animals you can see there (Campbell et al., 1985): there are as many nonlinear situations as there are non-elephant animals. Linearity describes the proportionality assumed in idealised situations where responses are proportional to forces and causes are proportional to effects (Strogatz, 2003). Linear problems can be broken down into pieces, with each piece analysed separately; finally, all the separate answers can be recombined to give the right answer to the original problem. In a linear system, the whole is exactly equivalent to the sum of the parts. However, linearity is often an approximation of a more complicated reality – most systems only behave linearly if they are close to equilibrium and are not pushed too hard. When a system starts to behave in a nonlinear fashion, ‘all bets are off’ (Strogatz, 2003). This is not to suggest that nonlinearity is necessarily a dangerous or unwanted aspect of systems. The biology of life itself is dependent on nonlinearity, as are the laws of ecology. Combination therapy for HIV/AIDS using a cocktail of three drugs works precisely because the immune response and viral dynamics are nonlinear – the three drugs taken in combination are much more effective than the sum of the three taken separately. The nonlinearity concept means that linear assumptions of how social phenomena play out should be questioned. It is important to note that such thinking has only relatively recently been incorporated into the ‘hard’ science paradigms and, moreover, is still only starting to shape thinking in the social, economic and political realms. Nonlinearity poses challenges to analysis precisely because such relationships cannot be taken apart – they have to be examined all at once, as a coherent entity. However, the need to develop such ways of thinking cannot be overstated – as one thinker puts it: ‘... every major unresolved problem in science – from consciousness to cancer to the collective craziness of the economy, is nonlinear’ (Capra, 1996). 5 It is important to distinguish nonlinearity as used here, which relates to relationships and proportionality, and nonlinearity in terms of sequences of events – one thing following another. 6 Note that the previously cited increase from 5 to 14.4% was due to natural, known feedbacks and does not include non-linear feedbacks 25 Although nonlinearity is a mathematical formulation, it is useful to take the suggestion that what is required is a ‘qualitative understanding of [the] quantitative’ when attempting to investigate them systematically (Byrne, 1998). Such a qualitative understanding has been furthered by the work of Robert Jervis (1997) on the role of complexity in international relations. Starting with the notion that understanding of social systems has tacitly incorporated linear approaches from Newtonian sciences, Jervis goes on to highlight three common assumptions that need to be challenged in order to take better account of nonlinearity. These assumptions provide a solid basis for investigating nonlinearity. First, it is very common to test ideas and propositions by making comparisons between two situations which are identical except for one variable – referred to as the independent variable. This kind of analysis is usually prefaced with the statement ‘holding all other things constant’. However, in a system of interconnected and interrelated parts, with feedback loops, adaptive agents and emergent properties, this is almost impossible, as everything else cannot be held constant and there is no independent variable. Jervis argues that, in such systems, it is impossible to look at ‘just one thing’, or to make only one change, hence to look at a situation involving just one change is unrealistic. Secondly, it is often assumed that changes in system output are proportional to changes in input. For example, if it has been assumed that a little foreign aid slightly increases economic growth, then more aid should produce more growth. However, as recent work by ODI and others argues, absorption capacity needs to be taken account – more aid does not necessarily equate to better aid. In complex systems, then, the output is not proportional to the input. Feedback loops and adaptive behaviours and emergent dynamics within the system may mean that the relationship between input and output is a nonlinear one: ‘Sometimes even a small amount of the variable can do a great deal of work and then the law of diminishing returns sets in [a negative feedback process] … in other cases very little impact is felt until a critical mass is assembled’ (Jervis, 1997). The third and final commonly made assumption of linearity is that the system output that follows from the sum of two different inputs is equal to the sum of the outputs arising from the individual inputs. In other words, the assumption is that if Action A leads to Consequence X and Action B has Consequence Y then Action A plus Action B will have Consequences X plus Y. This frequently does not hold, because the consequences of Action A may depend on the presence or absence of many other factors which may well be affected by B or B’s Consequence (Y). In addition, the sequence in which actions are undertaken may affect the outcome. Example: The growth dynamics model as an alternative to linear regression models Studies of economic growth face methodological problems, the foremost of which is dealing with real world complexity. The standard way of understanding growth assumes, implicitly, that the same model of growth is true for all countries, and that linear relationships of growth are true for all countries. However, linear relationships might not apply in many cases. An example would be a country where moderate trade protection would increase economic growth but closing off the economy completely to international trade would spell economic disaster. Linear growth models imply that the effect of increasing the value of the independent variable would be the same for all countries, regardless of the initial value of that variable or other variables. Therefore, an increase of the tariff rate from 0% to 10% is presumed to generate the same change in the growth rate as a change from 90% to 100%. Furthermore, the change from 0% to 10% is assumed to have the same effect in a poor country as in a rich country, in a primary resource exporter as in a manufacturing exporter, and in a country with well developed institutions as in a country with underdeveloped institutions. Despite some efforts to address these issues by relaxing the linear framework and introducing mechanisms to capture nonlinearities and interactions among some variables, this is still a poor way of addressing real world nonlinearity. Econometric research has identified that linear models cannot generally be expected to 26 provide a good approximation of an unknown nonlinear function, and in some cases can lead to serious misestimates (Rodríguez, 2007). Research at Harvard University has focused on the problem of designing a growth strategy in a context of ‘radical uncertainty’ about any generalised growth models. They call their method ‘growth diagnostics’, in part because it is very similar to the approach taken by medical specialists in identifying the causes of ailments. In such a context, assuming that every country has the same problem is unlikely to be very helpful. The principal idea is to look for clues in the country’s concrete environment about the specific binding constraints on growth. The growth diagnostics exercise asks a set of basic questions that can sequentially rule out possible explanations of the problem. The answers are inherently country-specific and time-specific. The essential method is to identify the key problem to be addressed as the signals that the economy would provide if a particular constraint were the cause of that problem. Implication: Challenge linearity in underlying assumptions Within complex systems, the degree of nonlinearity and relationships between various factors, and the lack of proportionality between inputs and outputs, means that the dynamics of change are highly context-specific. Therefore, if there are assumptions, aggregations and theories about the relations among different aspects of a specific situation, and these are not entirely appropriate when applied to the dynamics of a new local situation, then this perspective is unlikely to lead to a deep understanding of what should be done, and is furthermore unlikely to lead to the hoped-for changes. Nonlinearity implies that, as well as understanding the limitations of a particular model or perspective, it is important to build and improve new models that can provide the sort of information required for the particular task at hand. ‘No kind of explanatory representation can suit all kinds of phenomena ... any one diagnosis of [a] problem and its solution is necessarily partial’ (Holland, 2000). From this perspective, it is important to tailor to the particular situation one’s perspective on the dynamics of some phenomena. In a complex system, one must examine the complex web of interrelationships and interdependencies among its parts or elements (Flynn Research, 2003). It is important from the outset to understand the association and interaction among variables, rather than assuming that one causes another to change, and to look at how variables interact and feed back into each other over time (Haynes, 2003). Homer-Dixon, cited above, suggests that political scientists use methods that are modelled on the physical sciences, developing broad theories of political behaviour to generate hypotheses about causal relations between variables of interest. These ideas resonate strongly with a recent assessment undertaken for Sida on the use of the log frame (Bakewell and Garbutt, 2005), highlighting some of the advantages and disadvantages in a way which is particularly pertinent for this paper. In the international aid world, much of programme planning and development is undertaken using a set of methods and tools called the logical framework. For most of the study respondents, the advantage of logical frameworks was that they force people to think carefully through what they are planning to do, and to consider in a systematic fashion how proposed activities might contribute to the desired goal through delivering outputs and outcomes. As a result, many see the log frame as a useful way of encouraging clear thinking. However, these positive aspects were offset by the almost universal complaint that the log frame rests on a very linear logic, which suggests that if Activity A is done, Output B will result, leading to Outcome C and Impact D. This linear idea of cause and effect is profoundly ill-at-ease with the implications of complexity science and, indeed, the experiences of many development practitioners. The authors of the study sum up the problems of the log frame in a way that is key to our discussion of complexity: ‘Unfortunately (for the logical framework approach at least) we are not working with such a selfcontained system and there are so many factors involved which lie beyond the scope of the 27 planned initiative that will change the way things work. Although the LFA makes some attempt to capture these through the consideration of the risks and assumptions, these are limited by the imagination and experience of those involved. As a result the LFA tends to be one-dimensional and fails to reflect the messy realities facing development actors’ (Bakewell and Garbutt, 2005). Nonlinearity also has clear implications for the increased interest in randomised control trials (RCTs). While the implications of nonlinearity for techniques and tools such as the log frame and RCTs are increasingly well understood by many actors within the aid system, the answer to the deeper question as to whether incorporation of nonlinearity will be feasible, given the pressure on donors to justify aid budgets while having to deal with a reducing headcount, is less clear. The distinction between linearity and nonlinearity can be seen in as providing a theoretical underpinning of the frequently cited tension between upward accountability and learning. It also provides a means to re-frame the debate. If the two goals of accountability and learning are also about different mindsets, the degree to which an appropriate balance can be struck – without exploring these mindsets and the assumptions on which they are based – is open to question. Concept 5: Sensitivity to initial conditions Outline of the concept The behaviours of complex systems are sensitive to their initial conditions. Simply, this means that two complex systems that are initially very close together in terms of their various elements and dimensions can end up in distinctly different places. This comes from nonlinearity of relationships – where changes are not proportional, small changes in any one of the elements can result in large changes regarding the phenomenon of interest. Detailed explanation Imagine a small ball dropped onto the edge of a razor blade, as shown in the first image in Figure 4 below. The ball can strike the blade in such a way that it can go off to the left (centre image) or to the right (right-hand image). The condition that will determine whether the ball goes to the left or right is minute. If the ball were initially held centred over the blade (as in the first image), a prediction of which direction the ball would bounce would be impossible to make with certainty. A very slight change in the initial conditions of the ball can result in falling to the right or left of the blade. Figure 4: Sensitivity to initial conditions – ball striking razor blade Source: http://www.schuelers.com/ChaosPsyche/part\_1\_14.htm. The concept of phase space (Concept 6) allows a more precise understanding of initial conditions. Phase space allows for the analysis of the evolution of systems by considering the evolution process as a sequence of states in time (Rosen, 1991). A state is the position of the system in its phase space at a given time. At any time, the system’s state can be seen as the initial conditions for whatever processes follow. The sensitive dependence on initial conditions, in phase space terms, means that the position of a system in its phase space at a particular moment will have an influence on its future evolution. The interactions that are taking place at any moment in time have evolved from a previous moment in time, that is, all interactions are contingent on an historical process. Put simply, history matters in complex systems. 28 The infamous butterfly effect was a metaphor developed to illustrate this idea in the context of the weather. Edward Lorenz (1972), a meteorologist, used the metaphor of a flapping wing of a butterfly to explain how a minute difference in the initial condition of a weather system leads to a chain of events producing large-scale differences in weather patterns, such as the occurrence of a tornado where there was none before. As more recent thinkers have put it, in relation to complex systems in general, an initial uncertainty in measurement of the state of a system: ‘… however small, inevitably grow[s] so large that long-range prediction becomes impossible … even the most gentle, unaccounted-for perturbation can produce, in short order, abject failure of prediction’ (Peak and Frame, 1998). A large proportion of complex systems are prone to exhibiting the butterfly effect, so much so that some have defined complex behaviour as occurring where the butterfly effect is present (ibid). As no two situations will be exactly alike, the phenomenon will inevitably occur in many settings. As with nonlinearity, many have not used formal models to demonstrate the butterfly effect, but instead have tried to develop a qualitative understanding of the likely quantitative nature of real life situations. Sensitivity to initial conditions also means that ‘the generalisation of good practice [between contexts] begins to look fragile’ (Haynes, 2003) because initial conditions are never exactly the same, and because the complexity and nonlinearity of behaviour make it extremely difficult to separate the contributions to overall behaviour that individual factors have. Any notion of ‘good practice’ requires a detailed local knowledge to understand why the practice in question was good. This concept highlights the importance of understanding what can be forecast in complex systems to what level of certainty, as well as what is comparable across complex systems. It reinforces the point that both of these areas are necessarily restricted by the perspective of the observer. Sensitive dependence on initial conditions suggests that no single perspective can capture all there is to know about a system, that it may be wise to look in detail at how appropriate our solution to a problem is, and that it may be better to work with inevitable uncertainty rather than plan based on flimsy or hopeful predictions. This may mean, to take the example of predictability, that the success of a nation may be best explained not by its population’s virtues, its natural resources and its government’s skills, but rather simply by the position it took in the past, with small historical advantages leading to much bigger advantages later. Another example is how socioeconomic policy can result in a separation of neighbourhoods, driving a large gap between the rich and the poor so that, in short order, a gulf in wealth can result between two families who once had similar wealth (Byrne and Rogers, 1996). This is closely related to the notion of ‘path dependence’, which is the idea that many alternatives are possible at some stages of a system’s development, but once one of these alternatives gains the upper hand, it becomes ‘locked in’ and it is not possible to go to any of the previous available alternatives. For example, ‘… many cities developed where and how they did not because of the “natural advantages” we are so quick to detect after the fact, but because their establishment set off self-reinforcing expectations and behaviours’ (Cronon, cited in Jervis, 1997). In economic development, the term ‘path dependence’ is used to describe how standards which are first-to-market can become entrenched ’lock ins’ - such as the QWERTY layout in typewriters still used in computer keyboards (David, 2000). In certain situations, positive feedbacks leading from a small change can lead to such irreversible path dependence (Urry, 2003). Urry gives the example of irreversibility across an entire industry or sector, whereby through sensitive dependence on initial conditions, feedback can set in motion institutional patterns that are hard or impossible to reverse. He cites the example of the domination of steel and petroleum-based fuel models, developed in the late 29 19th century, which have come to dominate over other fuel alternatives, especially steam and electric, which were at the time preferable. The concept of path dependence has received some criticism from exponents of complexity science, because it has imported into economics the view that minor initial perturbations are important while grafting this onto an underlying theory that still assumes that there are a finite number of stable and alternative end-states, one of which will arise based on the particular initial conditions. As will be explained in Concept 7 on attractors and chaos, this is not always the case in complex systems (Margolis and Liebowitz, 1998).  Example: Sensitive dependence on initial conditions and economic growth Economists have generally identified sensitive dependence on initial conditions as one of the important features of the growth process – that is, what eventually happens to an economy depends greatly on the point of departure. There is mounting evidence that large qualitative differences in outcomes can arise from small (and perhaps accidental) differences in initial conditions or events (Hurwicz, 1995). In other words, the scope for and the direction and magnitude of change that a society can undertake depend critically on its prevailing objective conditions and the constellation of sociopolitical and institutional factors that have shaped these conditions. For specific economies, the initial conditions affecting economic growth include levels of per capita income; the development of human capital; the natural resource base; the levels and structure of production; the degree of the economy’s openness and its form of integration into the world system; the development of physical infrastructure; and institutional variables such as governance, land tenure and property rights. One might add here the nature of colonial rule and the institutional arrangements it bequeathed the former colonies, the decolonisation process, and the economic interests and policies of the erstwhile colonial masters. Wrongly specifying these initial conditions can undermine policy initiatives. Government polices are not simply a matter of choice made without historical or socioeconomic preconditions. Further, a sensitive appreciation of the differences and similarities in the initial conditions is important if one is to avoid some of the invidious comparisons one runs into today and the naive voluntarism that policymakers exhibit when they declare that their particular country is about to become the ‘new tiger’ of Africa. Such comparisons and self-description actually make the process of learning from others more costly because they start the planning process off on a wrong foot (Mkandawire and Soludo, 1999). Implication: Rethink the scope of learning and the purpose of planning in an uncertain world Sensitivity to initial conditions suggests that there are inevitably degrees of non-comparability across, and unpredictability within, complex systems. Some have argued that this implies that: ‘… the map to the future cannot be drawn in advance. We cannot know enough to set forth a meaningful vision or plan productively’ (Tetenbaum, 1998). The general implications for development theory and practice have been highlighted by a previous ODI working paper on participatory approaches, which suggests that this implies the notion of development as planned change is paradoxical. To quote directly, ‘… perfect planning would imply perfect knowledge of the future, which in turn would imply a totally deterministic universe in which planning would not make a difference’ (Geyer, cited in Sellamna, 1999). Sellamna goes on: ‘For this reason, development planning should abandon prescriptive, goal-oriented decision making and prediction about future states and focus instead on understanding the dynamics of 30 change and promoting a collective learning framework through which concerned stakeholders can constantly, through dialogue, express their respective interests and reach consensus.’ With regards to learning, this poses profound issues for the transferability of ‘best practice’, a concept that has taken on increasing meaning within the development sector since the rise of knowledge management and organisational learning strategies (Ramalingam, 2005). While it is possible that, for example, an understanding of the interplay of factors driving urban change in the Philippines may be relevant for analysis of urban change in Guatemala, this is not necessarily the case. The sensitivity to initial conditions gives us a strong reason to suppose that, even if we have a generally useful perspective on urban environments, this may entirely fail to capture the key features of the next situation we look at. This means that the search for ‘best practices’ may need to be replaced by the search for ‘good principles’. Some have suggested that the most appropriate way to bring the principles of effective approaches from one context to another is for ‘… development workers to become facilitators … enabling representatives of other communities … to see first hand what in the successful project they would wish to replicate’ (Breslin, 2004). Moving onto planning, to say that prediction of any kind is impossible may be overstating the case. Complexity does suggest that, in certain kinds of systems, future events cannot be forecasted to a useful level of probability and that, from certain perspectives, it is not possible to offer any firm prediction of the way the future will pan out on certain timescales. However, in other systems, future events can be foreseen in a helpful manner. For example, Geyer (2006) suggests that, with political dynamics, it is fairly safe to predict the short-term dynamics of basic power resources and political structures and that, therefore, there is decent scope for forecasting voting and decision outcomes of policy. On the other hand, examining party and institutional dynamics becomes more difficult, and grasping the potential shifts in contested political and social debates is even harder, while the longterm development of political dynamics is effectively characterised by disorder, as far as our ability to predict is concerned. It is important to clarify that certain levels of uncertainty are unavoidable when looking into the future. Complexity science suggests that it is important to identify and analyse these levels of unpredictability as part of the nature of the systems with which we work, and not treat uncertainty as in some way ‘unscientific’ or embarrassing. Rather than rejecting planning outright, there is a need to rethink the purpose and principles of planning. This has two key strands. First, it is necessary to incorporate an acceptance of the inherent levels of uncertainty into planning. The requirement for a certain level of detail in understanding future events should be balanced with the understanding that both simple and intricate processes carry uncertainty of prediction. While improving one’s models of change and analyses of facets of a situation may be worthwhile, it is just as important and often more practical to work with a realistic understanding of this uncertainty and build a level of flexibility and adaptability into projects, allowing for greater resilience. It has been argued that development projects have ‘fallen under the enchantment of [delivering] clear, specific, measurable outcomes’ (Westley et al., 2006). In many cases, this could be unrealistic, ineffective or even counterproductive; it is uncertain whether valuable social outcomes could be planned in terms of a specific series of outputs, and it is unclear why it is more productive to be able to hold agencies strictly accountable to promises at the expense of their promises delivering real results. This resonates with critiques of the log frame approach cited earlier, which argue that the adoption of the log frame as a central tool in effect and impact evaluations assumes higher powers of foresight than in fact is the case (Gasper, 2000). What is needed is higher levels of flexibility in the funding of international aid work, involving less stringent ‘targets’ and requirements from donors. The role of M&E would be shifted to value learning from unexpected outcomes. This is at the heart of the participatory approach to M&E developed by IDRC called outcome mapping. 31 Second, the way organisations look into the future should be adjusted by taking a more systematic and realistic view of what the future can hold: ‘A single vision to serve as an intended organisational future … is a thoroughly bad idea … not that the long term is dismissed as an effective irrelevance, [instead we need a] refocusing: rather than establish a future target and work back to what we do now to achieve it, the sequence is reversed. We should concentrate on the significant issues which need to be handled in the short term, and ensure that the debate about their long-term consequences is lively and engaged’ (Rosenhead, 2001). What is needed is a ‘pragmatic balance between present concerns and future potentialities’ (ibid); this means that ongoing systematic thinking about the future is an important task for any organisation working in development or humanitarian aid. Foresight is ‘the ability to create and maintain viable forward views and to use these in organisationally useful ways’ (Slaughter, 2003), and futures techniques, such as driver analysis or scenario planning, are suitable for this task. Scenario planning constructs a number of possible futures, in order to produce decisions and policies that are robust under a variety of feasible circumstances. This encourages a move away from looking for ‘optimal’ policies or strategies: ‘any strategy can only be optimum under certain conditions’ and ‘when those conditions change, the strategy may no longer be optimal’ (Mittleton-Kelly, 2003), so it may be preferable to produce strategies that are robust and insensitive to future variability rather than optimal for one possible future scenario. Path dependence and ’lock ins’ are also important to consider in the context of the practices of international aid agencies. The widespread use of the logical framework approach, despite the often serious critiques, is a clear example of path dependence at play. In fact, it could be argued that linearity has a ’lock in’ when it comes to the thought processes and approaches of international agencies. How ‘lock ins’ may be addressed in specific agency contexts is touched upon in Concept 7 on attractors and chaos  Concept 6: Phase space and attractors Outline of the concept The dimensions of any system can be mapped using a concept called phase space, also described as the ‘space of the possible’ (Cohen and Stewart, 1995).7 For any system, the ‘space of the possible’ is developed by identifying all the dimensions that are relevant to understanding the system, then determining the possible values that these dimensions can take (Romenska, 2006). This ‘space of the possible’ is then represented in either graphical or tabular form. In natural sciences, the prevalence of time-series data means that the phase space can be represented as a graphical map of all of the relevant dimensions and their values. In social scientific thinking, tables of data can be used to apply the same principles. The phase space of a system is literally the set of all the possible states – or phases – that the system can occupy. Phase space is particularly useful as a way to describe complex systems because it does not seek to establish known relationships between selected variables, but instead attempts to shed light on the overall shape of the system by looking at the patterns apparent when looking across all of the key dimensions. This resonates with a key point raised in Concept 1 – more may be learned about complex systems by trying to understand the important patterns of interaction and association across different elements and dimensions of such systems (Haynes, 2003). Phase space can be used to enable this kind of learning. By creating such a map of a system, it is possible to characterise how that system changes over time and the constraints that exist to change in the system (Musters et al., 1998). 7 Phase space is often used interchangeably with the phrase ‘state space’. 32 Detailed explanation The dimensions of a complex system mutually influence each other, leading to an intricate intertwining (Mittleton-Kelly, 2003) of these relationships and system behaviours to degrees of nonlinearity and unpredictability. Because of the challenges involved in analysing such systems, scientists studying complex systems have made use of a mathematical tool called phase space, which allows data relating to the dimensions of a system to be mapped rather than solved (Capra, 1996). Put simply, phase space is a visual way of representing information about the dimensions of a system. Rather than a graph, which attempts to show the relationships between specific chosen dimensions, phase space maps the possible values of each dimension of the system (akin to drawing the axes of a graph). This is the space within which a complex system displays its behaviour. Byrne gives the example of a city as a complex system (Byrne, 2006). He describes how the cities are complex problems in that they present situations where a range of variables are interacting simultaneously and in interconnected ways. He cites the specific example of Leicester, a city in the UK that grew from a small market town of 2,000 people in the 11th century to a city of 280,000 in 2001. Using the Census data from 2001, he shows that Leicester could be seen as a complex urban system made up of the following variables:

## 1NC Post-normal Futures-3

**Impact—Existential risk is systemic, not a flash of instability to be predicted and controlled. The 1AC brackets the full complexity of crisis and the value questions behind their scenarios—Preventing the ADAPTATION and RESILIENCE which is our only own hope for a viable future.**

**Mangalagiu 2011**

[Diana Mangalagiu, Prof of Strategy at Smith School of Enterprise and Environment-University of Oxford “Risk and resilience in times of globalization” An emerging research program for Global Systems Science: Assessing the state of the art, 10/4/11, <http://www.gsdp.eu/>] Mangalagiu 1

**1. Introduction**

The recent financial crisis highlights the challenges of, and the potential of catastrophic impacts from the failure to address global, systemic and long term risks. The crisis was neither prevented, nor effectively anticipated, by the hosts of experts in risks and futures employed by the industry. Despite the sophisticated strategic planning and risk management approaches adopted by individual banks and regulators, the lack of reflexivity in anticipatory knowledge processes, coupled with overconfidence in calculable and manageable risks, contributed to the denial, dismissal and ignorance of new forms of vulnerability and, in particular, systemic risk (Wilkinson and Ramirez, 2010; Selsky et al, 2008). It also highlights that risk management approaches that focus on stress testing the parts (e.g. individual banks, companies, governments, cities etc.) of a system are no longer enough.

The notion of systemic risk and practices of systemic risk management are being influenced by multiple traditions in scholarship (e.g. complexity science, resilience concepts), contesting theories of risk (e.g. social, mathematical, psychological) and the practical experiences harvested through professional bodies focused on risk management in banking and financial services, environmental management, urban planning, insurance and reinsurance, etc.

In this WP, we focus on identifying and comparing how risk management, the search for resilience and their respective approaches to strategic foresight and anticipatory knowledge might be better related and more effectively practiced in a range of different contexts such as at the organizational, sectoral-, national- and international-systems levels.

Our aim is to:

- Unpack what systemic risk means and how it is shaped by different disciplines and different traditions of risk management; also unpack what resilience means;

- Reveal and clarify how systemic risk and resilience are being operationalized in a range of settings and situations;

- Formulate research questions and develop knowledge, methodologies and guidance in order to reveal, inform and create so-called best and next practices in systemic risk management and governance and search for resilience.

Our first year deliverable is the state of the art concerning risk, systemic risk and resilience in times of globalization.

**2. Preliminary state of the art on risk and systemic risk**

2.a. General conceptions of risk 4

The conventional risk management paradigm assumes that a loss event is relatively limited, specific and isolated and with proper analysis can be anticipated and thus, avoided or contained and mitigated. In the conventional risk management paradigm the default is to forecast the future - or a probabilistic analysis – i.e. the assumption that the future is knowable.

Formal interest in risk and risk management originates from the fields of engineering and epidemiology in the 20th century (Kates & Kasperson, 1983) and from interdisciplinary studies of natural hazards (White & Haas, 1975). Since then the social sciences created significant independent contributions to risk research (Golding, 1992). Krimsky (1992) summarized the roles theory can take in risk analysis, which are quantitative laws, taxonomic frameworks, models, functionalist explanations, cognitive explanations, or analogical models and interpretive representations. Beck (1992, 1994) and Giddens (1991, 1999) pointed to the elaborate role risk plays in the macro organizational levels of modern society.

Societies are self-reflective in the sense that they seek to govern their own behavior to avoid catastrophic consequences. As such, the concept of risk is also politically relevant (Lupton, 1999). Providing an overview of the different perspectives on risk research, Renn (1992) distinguishes the technical perspective on risk (expected or modeled value, probabilistic risk assessment), economic perspectives (risk-benefit analysis), psychological perspectives (psychometric and cognitive analyses), sociological perspectives (plurality of approaches), and cultural perspectives (grid-group analysis).

While economic and technical risk assessments are similar with regard to their reductionist and one-dimensional view of the world, narrowing down risk analysis to a form of quantifiable expected value, psychometric, sociological, and cultural views take a multi-dimensional view that is concerned with 5 the myriad forms of risk perception. In Renn’s (1992) systemic classification of risk perspectives the main applications of the latter group are therefore seen in policy making, regulations, mediation, and risk communication, whereas the former be applicable for decision making (insurance, health, environmental protection, and safety engineering).

The different research strands can further be summarized regarding their theoretical focus on either the actual assessment of risk, the perception of risk, or blended approaches. Technical, economic, and quantitative social benefit approaches to measure risk can be counted towards those perspectives concerned with practical risk assessment (see e.g. Just, Heuth, & Schmitz, 1982; Lowrance, 1976; Starr, 1969), also apparent in the broad use of the value at risk concept in finance, which basically attempts to calculate an expected value of losses (see e.g. Jorion, 2007).

The psychological perspectives look into the perception of risk at an individual level (see e.g. Boholm, 1998; Slovic, 1987; Tversky & Kahneman, 1974) while the cultural theories of risk are concerned with the perception of risk at a collective level, as they see risk as the result of what different groups within a society – shaped by their social norms, values, and ontological assumptions – perceive as potential hazards (see Douglas & Wildavsky, 1982; Rayner, 1992; Thompson et al, 1990). In a way, cultural theories of risk attempt a form of risk assessment in a qualitative and social constructivist manner, while psychological theory examines the different perceptions of objective risks. Cultural theory has been criticized for seeing individuals only in aggregate, as being too simplistic, rather descriptive, and as being difficult to measure empirically (Renn, 1992). Marris et al. (1998) find some support for both the psychological and the cultural theory paradigms, although the cultural theory explains only very little variance in risk perception. As the only common denominator of sociological theories of risk is their awareness that human actors can only perceive the world through subjective social and cultural influences (Renn, 1992), they may best be seen as blended approaches leaning towards either weak or strong constructivist positions. Sociological perspectives further take into account what consequences arise from risk for the society (see e.g. Beck, 1992; Giddens, 1999) and bring fairness and competences into the picture, which can provide a basis for normative conclusions regarding risk policies (Renn, 1992).

The different theoretical conceptions of risk are non‐exclusive and can nurture each other. One attempt to integrate different perspectives consists in the Amplification of Risk framework, which builds on the analogy of signaling theory and sees risks to emerge from signals of initial real risks amplified in several steps of social interaction processes influenced by cultural setting (see Kasperson, et al., 1988; Kasperson, 1992; Kasperson, et al, 2003; Renn, et al, 1992).

2.b Systemic risk in the futures literature

In the futures literature2, the term ‘systemic risk’ is not featured frequently and has only been used recently (Checkley 2009). Other terms akin to systemic risk are in more frequent use. They comprise complex hazards (de Souza Porto & De Freitas 2003), extreme risks (Nakau 2004), emerging risks from science and technology (Wiedemann et al. 2005), catastrophic risk (Geiger 2005), natural disaster-triggered technological (natech) disasters (Cruz et al. 2006), extreme risks and **human extinction** (Tonn & MacGregor 2009), and high impact low probability events (Ord et al. 2010). While the last view of systemic risk (high impact with low probability event) comes closest to a definition, no coherent understanding of systemic risk yet exists.

Arguments for post-normal approaches to science and decision-making have been made in the literature, especially so for systemic risk (or close terms), but the explicit treatment of systemic risk so far is limited to case studies and selective areas of threats in the future. It seems that catastrophic or systemic risks per se have been of greater interest in the futures literature so far than the methods and tools to deal with them.

One stream of literature focuses on a conceptual approach to systemic risk. In this stream, three groups can be distinguished. The first follows a positivistic endeavor akin to classic risk management approaches quantifying systemic risk to make it measurable and in consequence manageable. The second group applies narrative scenario techniques and describes possible future systemic risks. The third class of works considers a classification of the severity of threats to mankind, and aims to identify the most threatening ones.

In an attempt to answer the question how much costs are bearable to protect against a catastrophic event, Nakau (2004) proposed a risk evaluation model, which classifies extreme events quantitatively. Based on stochastic probability he introduces tolerable levels of failure probabilities as a sustainability criterion, i.e. how many victims constitute a certain level of impact. Checkley (2009) employed an empirical test that explains the creation of systemic risk in a venture capitalist context, seeing systemic risk as risks affecting all parties. They argue that such risk occurs as mutual funds diversify their investment among several venture capitalists, but those syndicate for investment projects – so, diversification effects are unmade and are thus pseudo, which in turn gives rise to systemic risk.

A series of scenario works in 2009 have considered narratives explaining possible paths to the extinction of the human race (see Coates 2009; Goux-Baudiment 2009; Tonn & MacGregor 2009). Tonn & MacGregor (2009) describe a chain of events that can lead to the extinction of the human race over the next 1000 years. Goux-Baudiment (2009) on the other hand imagines a chain of events that could lead to human extinction in only 150 years. He further investigates the human agency in this scenario, and whether and how human interaction could break this disastrous chain of events. Tonn (2009) adds to those perspectives as he derives a theoretically acceptable risk level of human extinction from qualitative criteria (i.e. fairness, unfinished business, and maintaining options). He finds that the objectively acceptable level is lower than the currently (subjectively) expected level and concludes that risk must therefore be reduced.

In a different approach, Coates (2009) discussed extreme risks that humankind faces. He developed a classification system for those events, which centers on the severity of extreme events. The approach is similar to Nakau (2004) as it attempts to evaluate severity of risks, but different as it does not rely on quantitative criteria. Coates concludes that a nuclear winter, the use of nuclear weapons, and the eruption of a super-volcano are the most severe threats to civilization and humankind, but that other events such as asteroids also bear some risk.

Another stream of literature focuses on the perception and social construction of systemic risk. First, studies look into the paradoxical situation of policy makers to stimulate innovation but also to regulate risks arising from accelerating innovation. This argument is put forward to support post-normal science and decision-making as the appropriate approach to modern (systemic) risk management situations. Then, risk perception biases for catastrophic risk have been examined and ultimately, the classic reductionist treatment of risk management was held responsible for rising occupation with risk in society.

Public actors play a paradoxical role in the relationship between risk and innovation, between the interests of the public and private actors (Ravetz, 2003). Ravetz sees accelerating innovation as a necessary tool for private companies to compete in a ‘globalizing knowledge economy’ and the role of the public to ensure an environment in which speedy innovation can take place. On the other hand, public actors need to ensure the safety of new technologies and innovation acting as an agent for their citizens, remaining the source of public trust and safety provider for citizens. Besides this paradoxical role, technological innovation threatens the global environmental system; so, how much technological 7

innovation is desirable and how much risk in it acceptable? Ravetz argues that finding appropriate answers to this question can only be found in a policy-making process that involves the public in dialogues about scientific findings and by disclosing ambiguities in scientific finding, thus embracing policy principles for a post-normal world of science.

**Continued (8 pages later)…**

**4. Preliminary state of the art on resilience**

In contrast to the conventional risk management approach and linear risk paradigm, the search for resilience tends to emphasize that there is no such thing as a ‘zero risk society’ and suggests, instead, that there is a need for groups and organizations to collaborate in building the adaptive capacity that enables the whole system to organize and re-organize in the face of inherent uncertainty, emergence and inevitable surprise.

The resilience approach accepts change as inevitable and endemic and focuses on building the adaptive capacity of the system and its ability to re-organize and transform after a disturbance. Resilience is most commonly used to describe the ability of an entity to withstand and respond to shocks in the external environment. The concept of resilience is becoming a core concept in the social and physical sciences and in matters of public policy. Definitions of resilience, however, vary. There is neither scientific nor professional agreement on what constitutes resilience principles and the operationalization of these principles in practice. However, as a general definition of the resilience of a particular system – the ability to maintain critical functions in the face of regular disturbance from a range of shocks (threats) combined with ability to adopt adaptive behavior when facing unknowable or unexampled disturbances – is the commonly used one.

Intellectual traditions on resilience are a still emerging and chaotic field, fragmented across different disciplines and professional practices. The concept of 'resilience' has already been constructed in a 10 variety of fields and traditions, including engineering, systems ecology, political sciences, management and organization theory, cultural theory, complex adaptive systems, cybernetics and psychology.

An initial review of the literatures relating to resilience reveals a fragmented field. In social ecology, resilience is concerned with the longer-term survival and functioning of ecosystems – species, populations and services in a changing or fluctuating operating environment.

The social ecology approach introduced by Holling (1973) argues ecological systems are non-deterministic because of inherent complexity. characterizes the ecosystem as complex set of elements and parts existing in dynamic interrelationship and interdependency. The key contribution of the ecological view of resilience is to provide a focus on the systemic nature of the problems and on the longer-term demands on policy and management. It emphasizes the need to keep options open, while appreciating heterogeneity and keeping a broader than local view organization – this is in contrast to dominant management approaches which are concerned with compartmentalizing issues, limiting change to the margins and views of the future rooted in attempt to preserve the present. **The critical distinction is that between resilience and stability**. The stability/equilibrium paradigm approaches the future with the aim of strengthening the status quo by making the present system “resilient to change” and aiming to achieve stability and constancy.

In the management literature, the focus when using the resilience concept is on the persistence and survival of individual businesses and institutions in face of change. A bulk of the management literature on organizations focuses on the strategies for individual businesses to be ‘resilient’ to change -- on innovation, experimentation and leadership to ensure survival and growth of a specific institution/business -- however the ecosystem perspective requires us to think about the health and of the forest and the services its provides rather than the role of individual species! What are the sources of resilience in the system and or an organization? The process of increasing resilience is different from optimization and improving system performance in existing conditions – what organizational characteristics build resilience. Successful adaptation requires for individual organizations, agents and businesses to continue to full fill their own goal and function but must also include measures of promoting adaptive capacity of the system.

Despite the richness in conceptual thinking underpinning the concept of resilience, there is limited evidence of how groups, organizations are societies are translating the notion of resilience into practice. The constructivist tradition in social theory argues that social response is non- deterministic because of plural perception and the negotiations of values, cultures, choices and epistemologies. The managers are part of the system that is being managed and define the system and its characteristics in different ways. Understanding the loss, creation and maintenance of resilience through the process of co-discovery – scientists, policy makers, practitioners, stakeholders and citizens is at the heart of building the capacity to deal with whatever the future might bring.

Anecdotal evidence suggests that some societies are organizing for resilience. For example, both the governments of Canada and Singapore have resilience as the goal of their national strategic plans. There is a nascent literature emerging, as yet unmapped, on operationalizing resilience beyond the organizational level. For example, in an approach to adapting an urban delta to uncertain climate change, Wardekkar et al. (2009) identify five options for resilience: (1) homeostasis: incorporation of feedback loops; (2) omnivory: having several different ways of fulfilling needs; (3) flatness: preventing a system from becoming too top heavy enables more effective localized responses, self-reliance and self-organization; (4) buffering: the ability to absorb disturbances to a certain extent and (5) redundancy: having multiple options – routes, supply chains, etc – so that if one fails, others can be used. 11

The resilience frame opens the opportunity to think in terms of nonlinear and non-deterministic futures and, in doing so, to displace practices in **probable futures** with plausible and **preferable** futures. The resilience frame also invites attention to realizing transformation, rather than future proofing of established structures, identities and values. It invites consideration of the uncertainty as irreducible and inherent, going beyond the lack of knowledge and encompassing ambiguity and ignorance.

## 1NC Post-normal Futures-4 (optional)

**Only imagining transportation policy as COMPLEX SYSTEM enables resilient infrastructures that can adapt to the emergence of interconnected risks.**

**Wilkinson 2012**

[Cathy Wilkinson, urban spatial planning at Stockholm Resilience Centre, Stockholm University, “Social-ecological resilience: Insights and issues for planning theory” Planning Theory May 2012 vol. 11 no. 2 148-169] Wilkinson 1

I argue that at a time when planning theorists are calling for more attention to matters of substance alongside matters of process, social-ecological resilience provides a timely contribution with its specific attention to linked social-ecological systems. Further, the particular way in which linked social-ecological systems are conceptualized – as complex adaptive systems – responds to recent calls within planning theory for more attention to the implications of non-linear dynamics of ecosystems. Given the minimal attention in planning theory scholarship to environmental and ecological considerations as a driving concern, this is particularly relevant. I clarify that social-ecological resil­ience is most relevant for normative planning theory rather than critical planning theory, given that it is yet to develop a strong theoretical basis for addressing matters of power, conflict, contradiction and culture. Finally, I suggest that perhaps the most significant contribution of social-ecological resilience for planning is its role as a different and use­ful frame for both problem-setting and problem-solving.

Social-ecological resilience originates in systems ecology (Holling, 1973) and is based on assumptions of non-linear dynamics of change in complex, linked social-ecological systems (Folke, 2006). These understandings challenged the foundational underpinnings of traditional natural resource management (including assumptions such as equilibrium, stability and predictability) (Holling, 1978) and gave priority instead to more adaptive modes of governance and attention to cross-scale interactions (Gunderson and Holling, 2002; Walker et al., 2009).

Social-ecological resilience, with its focus on the governance of linked social-ecological systems, is of interest to the field of planning for several reasons. First, there is increasing general recognition of the critical importance of ecological consid­erations for urban studies (Davoudi and Mehmood (eds) 2010; Evans, 2011; Murdoch, 2006). This is driven significantly by the disproportional detrimental impact cities have on the global environment (Grimm et al., 2008) and increased attention to bio­physical planetary boundaries (Rockström et al., 2009), including climate change (Davoudi et al., 2010; Wilson and Piper, 2010). In this respect I take up the challenge increasingly raised by planning theorists (see for example Campbell, 2006; Dear, 2000; Fincher and Iveson, 2008; Ness and Saglie, 2000) to give more attention to sub­stantive matters (in this case ecological concerns) in planning theory, as distinct from the current emphasis in planning theory on matters of process. Second, and more par­ticularly, the question has been asked in planning theory: what would it take to ‘think planning again’ (Swyngedouw, 2010: 313) in ways that acknowledge the contingency, unpredictability and inevitability of ecological processes? Social-ecological resilience has already been identified as having potential to assist planning with such questions (Wilkinson, 2010), albeit little theoretical work has progressed. Third, ‘resilience’ is ‘increasingly influential’ as an urban policy discourse and has now been taken up by a wide range of international urban initiatives as well as national and metropolitan pol­icy agendas (Evans, 2011). Critical examination of the assumptions underpinning social-ecological resilience is therefore timely. Finally, there is strong prima facie case for inter-disciplinary learning between social-ecological resilience and planning. Both disciplines are fundamentally concerned with human–nature relations, directly related to practice domains (natural resource management and urban governance, respec­tively), concerned with cross-scale spatial dynamics in complex systems, and share a normative interest in sustainability (Wilkinson et al., 2010).

To date there has only been limited inter-disciplinary research across these two fields, albeit the general use of resilience as an analytical framework of sorts for urban related studies is quickly expanding and now includes the following: mitigation and adaptation to climate change (Wardekker et al., 2009); **disaster planning,** management and recov­ery (Campanella, 2006; Goldstein, 2008; Goldstein, 2009; Vale and Campanella, 2005); energy and environmental security (Coaffee, 2008); **climate change** (Deppisch and Hasibovic, 2011; Pelling and Manuel-Navarrete, 2011); urban water management (Blackmore and Plant, 2008; Pahl-Wostl, 2007); **integrated land use and transport planning** (Newman et al., 2009); and **urban design** (Colding, 2007; Pickett et al., 2004). However, the degree to which social-ecological resilience per se informs these varies significantly across the publications. Research that does take an explicit social-ecological resilience approach to planning explores the mutual interest resilience and planning scholars share in collaborative deliberation as a way to improve society’s response to a wide range of surprises (see Goldstein, 2009); provides a practitioner’s perspective on the relevance of social-ecological resilience for metropolitan planning (see Wilkinson et al., 2010); and explores the potential of resilience as a metaphor to enable a reframing of inter-disciplinary integration between **ecology**, **urban planning and urban design** (Pickett et al., 2004). There has, however, been little engagement to date in the implications social-ecological resilience raises for planning theory per se. It is this research gap to which this paper contributes.

Three key tasks for planning theory are identified by Friedmann (2008) – the *philo­sophical* task, the task of *adaptation* and the task of *translation*. The latter of these – the task of *translation* – is the focus of this paper and here I explore the implications of knowledge and insights generated by resilience scholars for planning theory. Forester (1993: 1–2) argues that ‘powerful theories re-direct us toward problems and issues we might otherwise have ignored – or from which we have been ideologically or methodologically distracted’. The purpose in looking to social-ecological resilience then is to explore what problems and issues planning theory may have ignored with respect to our understanding of linked social-ecological systems. Whilst there are of course insights that social-ecological resilience can translate from planning theory, this is not the focus here.

# Topic Links

## Topic Link-Transport Sys-1

**Complexity is a prerequisite to effective transportation policy—The 1AC’s linear account of disconnected causes fails when applied to interlocking dynamic complex systems.**

**Dodder 2000**

[Rebecca Dodder, Technology and Policy Program at MIT “The Evolving Systems View of Transportation: Implication for Policy” <http://web.mit.edu/esd.83/www/notebook/Final%20Dodder.PDF>] Dodder 14

Haefner represents the process of citizen participation as an iterative process of the transportation planner presenting the alternative designs to citizen groups for their acceptability and/or modifications. This process would be repeated at each stage from initial planning to final design and implementation, until a sufficient level of acceptance allowed progress to the next stage. Notwithstanding, it remains the responsibility of the transportation engineer to determine what are the technically feasible *alternatives*. The importance of this role of the transportation engineer not be understated, if there is validity to E.E. Schattschneider’s proposition that “the definition of the alternatives is the supreme instrument of power” (quoted in Kingdon, 1994). For this reason, attention should be given to assess how the definition of these alternatives is shaped or, in some cases, even constrained by the mainstream systems approach to transportation design.  **AN EMERGING TRANSPORTATION SYSTEMS FRAMEWORK - COMPLEXITY**The field of transportation systems in the post-WWII period has witnessed many advances and remarkable technological achievements, yet many of the messiest and most complex planning and policy problems with which analysis were grappling in the 1960s remain. For this reason, Manheim’s statement continues to ring true, possibly with even greater emphasis today, as some transportation systems, such as those in developing megacities, are in precarious states with sometime debilitating problems of congestion and pollution. “The challenge of transportation system analysis is to intervene, delicately and deliberately, in the complex fabric of a society to use transport effectively, in coordination with other public and private actions, to achieve the goals *of that society*” (Manheim, 1979). Despite the technical, analytical and theoretical advances that the field has undergone, much of the traditional systems framework remains firmly in place. For many of these complex problems, assumptions about systems such as rationality, equilibrium, homogeneity, perfect information, linearity, stability, and order continue to hold. While this is a broad generalization for an extremely diverse and multidisciplinary field, these assumptions seem to form the underpinnings of most of the broadly-accepted theories and methodologies.  Applying Complexity Theory to Transportation?  Among the early groups of scientists working to develop theories of Complexity, many have  found urban transportation systems to be an intriguing system to study through simulation  modeling. Examples of these models can be found in Resnick (1994) and Casti (1997).  However, for the purposes of planning, managing and policymaking with respect to  transportation systems, the more relevant question is to what extent researchers and practitioners  in transportation employ the complexity framework. Referring to Sussman (2000b), this work  indicates that transportation systems are increasingly being examined in this framework:  Transportation systems are complex, dynamic and internally  interconnected as well as interconnected with other complex dynamic  systems.  They vary in space and time (at different scales for different  components). Service is provided on complex network. Systems are  stochastic in nature.  Human decision-makers with complex decision calculi make choices that  shape the transportation system. Modeling the entire system is almost  unthinkable. Our challenge is to choose relevant subsystems and model  them appropriately for the intended purpose, mindfully reflecting the  boundary effects of the unmodeled components (Sussman, 2000b).  In fact, in Introduction to Transportation Systems, transportation is emphasized as prototypical  of Complex, Large, Integrated, Open Systems (CLIOS). Although most of the literature linking  transportation systems to the ideas of complexity theory focuses on urban transportation  networks, typically in the form of agent-based modeling of individual drivers, the concept of  CLIOS is extended to all transportation modes

from freight transport, railroads, ocean shipping(Sussman, 2000a).

shipping  (Sussman, 2000a).   **Modeling from the Bottom-up**One area in which one can clearly discern a link to the concepts of complexity theory is in simulations of urban transportation networks. In transportation modeling, many analysts have begun to apply the methods of agent-based modeling. The most notable of these models is an agent-based micro-simulation of urban traffic patterns called “TRANSIMS” (Transportation Analysis and Simulation System). The model was developed in the mid-1990s by researchers at Los Alamos National Laboratory, which is not surprising, given the lab’s geographical and intellectual proximity to the Santa Fe Institute, the hub of the Complexity community. The model’s developers describes the underlying philosophy of TRANSIMS as the following: Individual behaviors and their interactions, as constrained by the transportation system, generate the transportation system’s performance. To effect that performance in a simulation, individual behavior must be modeled (Bush, 2000). Because it is agent-based, the model simulates all entities of the traffic system from travelers to traffic signals as individual agents with specific rules of interaction (Nagel, et al, 2000). The movement of individuals is simulated in one-second time increments, with each individual vehicle moving across the cellular automaton grid cells of the transportation network. While the model breaks from other simulation models in terms of its extremely high level of disaggregation and adaptive interactions between individuals, many of the underlying concepts evolve quite naturally from the general analytical shift in transportation modeling that has occurred during the past decades. This shift includes a move from representing traffic as deterministic flows between fixed origins and destination to examining the internal dynamics and adaptive behaviors of heterogeneous agents moving on an uncertain landscape.

## Topic Link-Transport Sys-2

**A framework that reckons with the complexity of transport systems is a prerequisite to accurate predictive policy-making**

**Dodder 2000**

[Rebecca Dodder, Technology and Policy Program at MIT “The Evolving Systems View of Transportation: Implication for Policy” <http://web.mit.edu/esd.83/www/notebook/Final%20Dodder.PDF>] Dodder 1

INTRODUCTION

Systems Thinkers

Transportation systems are intricately interwoven with nearly every facet of human activities,  from work and production, to leisure and consumption, supporting a worldwide flow of goods,  and linking societies. As these large technical systems become a pervasive and integral  constituent of modern society, the manner in which human forces perceive, analyze and attempt  to shape the development of these systems becomes increasingly complex, and increasingly  important. One of the core concerns of this paper relates to “the role that networks of  knowledge-based experts - epistemic communities - play in articulating the cause-and-effect  relationships of complex problems, helping [actors] identify their interest, framing the issues for  collective debate, proposing specific policies, and identifying salient points for negotiation”  (Haas, 1992). While the precise definition of the term “epistemic communities” is the subject of  continuing discussion, for the present purposes it can be taken to refer to a group of practitioners,  scientists or engineers, who share a common set of methodologies, techniques and other forms of  knowledge.  1  Purpose  The purpose of this current paper is to survey the nature of these epistemic communities within  the field of transportation systems, in order to identify certain persistent patterns as well as  evident shifts in the systems view of transportation. The motivation behind this is the hypothesis  that the systems framework for understanding a system has a significant impact on the manner in  which modeling, design, planning and policymaking is carried out within that field. The ultimate  question being addressed in this exercise can be stated as the following: How has the “systems  thinking” changed over time with regard to transportation systems and can one observe related  changes in the transportation planning and policy processes?

## Topic Link-Urban Infrastr

**Infrastructure investment is NOT a game of Sim City—Resilience requires focus on the complex interconnections between social, ecological, and economic systems.**

**Ruth and Coelho 2006**

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“Managing the Interrelations Among Urban Infrastructure, Population, and Institutions” Forschungszentrum Nachhaltigkeit (artec-paper Nr. 136)] Ruth Coelho 1-2

Increases in urban populations, aging infrastructures and global environmental change have begun to highlight the need and urgency to address urban resilience through research and stakeholder-based dialog. The number of case studies for individual locations and on individual challenges – such as meeting water or energy demands – are increasing. Many of those studies reveal the complexity of managing interrelations among population, infrastructure, and institutions, though many ultimately choose a narrow, sector-specific approach to the issue. Few approaches have built on insights from complexity theory and related bodies of knowledge which are more consistent with the perspective that urban infrastructure systems are tightly coupled with one another and must respond to often subtle, long-term changes of technological, social and environmental conditions. Drawing on that knowledge, and building on insights from previous case studies, this paper explores the potential roles of complexity theory in guiding investment and policy decisions in the urban context, focusing on strategies to promote resilience and adaptability in the light of population, infrastructure, and institutional dynamics.

1. Introduction

As the number of people and the volume and intensity of economic activities in cities are growing worldwide, the influences of cities on the local and global environment are rising. The repercussions of that environmental change, in turn, are felt by the inhabitants of cities and their hinterlands, as well as by the economic sectors that sustain livelihoods. Traditional urban analysis has focused on the individual drivers behind urban change and individual impacts on people, the economy, and the environment (e.g., Robson 1969, Dear and Dishman 2002). Although urban systems analysis is often rich in empirical detail or theoretical conceptualizations dealing with both the temporal and spatial dimensions of urban change (e.g. Black and Henderson 1999, Fujita et al. 1999, Brenner 2000), the **interconnection** among the various drivers and repercussions – social, economic, and environmental – frequently has been acknowledged but rarely has become, in its own right, the object of analysis. *Where the focus truly has been on the complexity of urban change, the products were often either computer-based exercises or conceptual frameworks. Most popular among the former are simulation games, such as* ***SimCity****™ (EAI 2005), which concentrate on the evolution of a hypothetical or stylized urban system. In such games, a single player typically interferes in a system’s dynamics through various choice variables and learns to appreciate the complexity and uncertainty inherent in system intervention.*

Examples of systematic, theory-based conceptualizations of urban change include work by Peter Nijkamp and colleagues (e.g. Nijkamp and Reggiani 1992, Camagni et al. 1998), Jan Rotmans (1994, 2006), Michael Batty (2005), Patsy Healey (2007 in press), and a large number of others, many of whom have begun to view urban dynamics through the lens of modern complexity theory. Some of the recent research in this area illustrates a merger between urban simulation and complex systems analysis, by explicitly basing computer simulations of urban dynamics on, and interpreting outcomes of urban dynamics from the perspective of complexity theory. We will briefly discuss some of these studies in more detail below.

More recently, a new flavor of urban analysis has developed, one that is pragmatic in nature and that combines, among other approaches, theoretical, empirical, simulation-based, and stakeholder-guided assessments. The pragmatic aspect of the research lies in the identification and study of issues relevant to decision makers, and in efforts to make findings relevant to the decision making process. Much of that work has been spawned by the debate about regional impacts of, and adaptations to climate change (Ruth 2006a). While promising in many regards, several challenges remain for that work to be academically rigorous and, at the same time, relevant for investment and policy making. The discussion below addresses the state of the art, critically summarizes the promises that integrated analysis holds for advancing knowledge and improving decision making in the urban context, and highlights the main challenges that remain.

With the intent to contribute to the advancement of urban systems analysis for the management of urban systems, this paper first briefly reviews key drivers of urban change. Here we concentrate on general urbanization trends, changes in urban metabolism, the role and state of infrastructure, urban environmental quality, and urban quality of life. The subsequent section discusses two sets of complementary approaches to better understand complex urban change processes – one predominantly from the perspective of the basic sciences, the other from a more policy-oriented, integrated assessment approach. That discussion raises issues germane to the study of complex systems, which we address in Section 4 of the paper. We close with a brief summary and conclusions.

## Topic Link-Urban Infrastr

**Complexity is a prerequisite to effective infrastructure policy—We must adapt to unpredictable change.**

**Ruth and Coelho 2006**

[Matthias Ruth is visiting professor at artec, Center for Sustainability, University of Bremen, Germany, Director of the Center for Integrative Environmental Research and co-director of Engineering and Public Policy at the University of Maryland

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“Managing the Interrelations Among Urban Infrastructure, Population, and Institutions” Forschungszentrum Nachhaltigkeit (artec-paper Nr. 136)] Ruth Coelho 6

**2.2.4 Risk, Uncertainty and Surprise in Planning and Management of Infrastructure Systems**

Since infrastructure systems typically have long life spans, their presence reflects knowledge and perceptions that decision makers have about the physical, biological and economic environment, as well as their expectations for the future. Capacity and design criteria for infrastructure systems typically are based on historic observations and extrapolations into the future. Planners ask themselves: What will be the size and income of the population over the next 20 years? What will be the rate of car ownership and travel demand? What are likely changes in land use, industrial, and residential location? How rapidly will relative employment and output shift among sectors of the economy? Answers to such questions are found on the basis of economic and planning models, most of which base their projections on an analysis of historic data. Safety margins are introduced into the projections to deal with risk and uncertainty. Yet, since planners and decision makers deal with socioeconomic systems that co-evolve in close relationship with other socioeconomic systems and their environment, there is ample room for surprises to occur and for projections to fail. For example, few investments in sea and airports, tunnels, and roadways reflect the impacts that climate change may have on sea level rise or increased adverse weather conditions, and therefore a need for better drainage and flood management. Current investments in transport infrastructure may also be misplaced if telecommuting and internet commerce gain in economic importance – those investments are too high if the advent of new communication technology leads to a reduction in transport demand; too low or geographically misplaced if new communication technology boosts economic activity and requires increased (long-distance) transport of goods, services, and people (Golob and Regan 2001).

The size of capital requirements, long lifetimes, pivotal role in socioeconomic development, and environmental impacts of infrastructure require institutions to take the long view. At times of rapid change in population size, economic activity or technology, traditional methods of forecasting future demands for infrastructure systems and services on the basis of past trends is likely to be inadequate. By the same token, a host of large-scale, long-term drivers such as climate change require that current design criteria are revisited, and that existing and new infrastructure is (re-)built to withstand, for example, higher wind, heavier snow and ice loads, higher surface temperatures, increased drought and precipitation, or elevated sea levels. As infrastructures adjust, volumes and patterns of material and energy use in urban areas (and their surroundings) change.

# Block Module 1-‘that vision thing’

## TVT Mod-AT perm-1

**The perm will not overcome the link because they are travelling in the OPPOSITE DIRECTION—They bury uncertainty rather than admit the limits of prediction—Sustaining the status quo rather than imagining fundamental transformation.**

**Mangalagiu 2011**

[Diana Mangalagiu, Prof of Strategy at Smith School of Enterprise and Environment-University of Oxford “Risk and resilience in times of globalization” An emerging research program for Global Systems Science: Assessing the state of the art, 10/4/11, <http://www.gsdp.eu/>] Mangalagiu 4

***The resilience frame opens the opportunity to think in terms of nonlinear and non-deterministic futures and, in doing so, to displace practices in probable futures with plausible and preferable futures\*.***

The resilience frame also invites attention to realizing transformation, rather than future proofing of established structures, identities and values. It invites consideration of the uncertainty as irreducible and inherent, going beyond the lack of knowledge and encompassing ambiguity and ignorance.

**5. An attempt to bring risk and resilience together**

As we’ve seen in the previous sections, the concepts, tools and methods of risk and resilience are each being informed by a whole range of scholar disciplines and professional practices. Whether a pattern of parallel development or co-evolution is occurring is not clear yet and as a result there is a lack of clarity about how and whether notions of risk and resilience differ, overlap or can be better related or conflated. However, we believe that exploring the similarities and differences in new forms of risk management approaches and the search for resilience is helpful.

As an alternative to the risk frame, resilience can be interpreted as adaptive capacity enabled through respect of pluralism, encouraging a shift in approached from ‘predict and provide’ to ‘regroup and move on’, transforming rather than reforming systems and entities in recognition of the need for ‘better reactive preparedness’, by rehearsing actions with alternative futures.

In the figure below we attempt to capture the intellectual traditions and points of encounter between risk and resilience approaches.

**\*bold italicized read in 1nc… could skip in the block**

## TVT Mod-AT Perm-2

**The perm coopts resilience for their plan, bracketing broader questions for whether existing systems are sustainable**

**Wilkinson 2012**

[Cathy Wilkinson, urban spatial planning at Stockholm Resilience Centre, Stockholm University, “Social-ecological resilience: Insights and issues for planning theory” Planning Theory May 2012 vol. 11 no. 2 148-169] Wilkinson 9

That said, planning theorists should also be alert to attempts to co-opt social-ecological resilience in ways that continue avoidance of ecological issues (Wilkinson et al., 2010). Brand and Jax (2007: 6) observe that ‘ resilience is a two-faced concept’, being used on the one hand as a ‘descriptive, ecological concept’ and on the other hand as ‘a boundary object with a rather wide and vague meaning’. As social-ecological resilience is increas­ingly translated into the planning field, clarity around the manner in which it is being used is important. I argue that taking on board the broad conceptual power of resilience as a metaphor without working through the implications of the ecological message con­tained therein is a lost opportunity that planning theorists cannot afford if it is to contrib­ute to improved urban governance at a time of ecological crisis.

**Rejection is key – allowing the aff solidifies their ideology and undermines the alt**

**Chapman, 04** – Jake, renowned systems thinker and former professor of energy systems at the Open University (“Preface to the second edition,” *System failure Why governments must learn to think differently*, Second edition, First Published 2002, second edition 2004, Demos, http://www.demos.co.uk/files/systemfailure2.pdf)RK

System Failure offered some answers to these questions, but underestimated the deeper fears involved. Managers who cannot control are afraid of being regarded as ineffective or weak. policymakers who are paralysed by unpredictability are regarded as ditherers – and again ineffective. In both cases they are likely to be replaced by people who claim that they can control and predict. So adopting a systemic perspective may challenge an individual’s self-esteem, their perceived worth in the world and their career. These fears can be addressed by making an explicit virtue of a systemic approach – but in a culture which is focused on delivery and control it will require support and acceptance from those above. Learning difficulties System Failure argues strongly for learning as the key way to handle complexity and its associated lack of predictability and control. It includes a detailed analysis of the obstacles to learning that exist within government and the civil service. However, that analysis omitted the biggest obstacle of all – namely the presumption of knowing best. This presumption **completely closes the door to any learning experience** – if one already knows the answer or knows best there is no need to learn anything. As with mechanistic thinking there is a great deal in the culture that reinforces this attitude. People who are promoted to higher positions of authority interpret their promotion as a validation of their knowing best. Politicians who are elected interpret it as an endorsement of their views. And within Whitehall there is sense that people there know best – if only because to be a senior civil servant in Whitehall one has to outshine one’s peers. Knowing best not only closes the door to learning, it also closes off the possibility of understanding other perspectives. Individuals andagencies with different perspectives – and hence different preferences, priorities and action plans – are dismissed in terms of vested interests or political opposition (both of which may be true, but neither of which affords a manager or policy-maker to ignore the perspective).

## TVT Mod-Link Wall—1

**Start with the question of what kind of future you want to sustain—The 1AC locks in a transportation path rushing towards catastrophic collapse—At best they tinker with a one tiny part of a complex system, but this is outweighed by the increase in fragility of the overall system**

**Inayatullah 2003**

[Sohail Inayatullah, Prof at Tamkang U, “Alternative Futures of Transport” *foresight* 5.1: 34-43] Inayatullah 6

Which future? The future that citizens prefer, however, should not be seen entirely as an issue of agency. Clearly, agency ± our travel choices ± is important. The Whitehall Health Studies show that health is directly related to the sense of individual agency or ``destiny'', which in turn is largely determined by socio-economic position. Standard allowances for health such as smoking, diet, exercise were found to account for only a quarter of variations in health-agency and its related socio-economic position accounted for most of the rest 􏰀Marmot and Wilkinson, 1999). What this means is that individuals need to be part of active citizenship, active decision making on their transportation futures. Riding a bicycle is not just good for weight loss, muscle toning and reducing the likelihood of numerous diseases, but it also gives one agency. Road rage, I would argue, can be directly attributed to the absence of such agency ± there is very little one can do in such a situation. To paraphrase a famous Hollywood movie, ``Who you gonna call F F F Rage Busters''. But agency is affected by other variables. The futures triangle One way to map this is using the futures triangle. In this modelling method, three factors are crucial. First are the images of the future. These pull us forward. Second are the pushes of the future. Third are the weights. Taken together they create the plausible future 􏰀see Figure 1). What then are some macro images of the future 􏰀at this stage going to a level above the meso of transportation futures)? Four are crucial 􏰀for a diagram relating these to city futures, see Appendix, Figure AI). 􏰀1)  From triple bottom line to Gaian. This is the image of  sustainability, the new environmental paradigm that challenges the traditional industrial paradigm. It is not technology-averse, but the use of technology is for clearly defined values:genderpartnership,global ethical governance, inner spirituality, social justice and ecological sustainability.  􏰀2)  From industrial realism to likely collapse. This is the traditional way of organizing society, around silos using  non-renewable resources. Built into the model, however, are deep divisions based on gender, class, civilization and nature. Over time, this is likely to lead to society collapse whether from global warming, stock market crashes, terrorism or other factors associated with systems that have overshot their limits. 􏰀3) The third is global technologization leading to artificial societies. This is the mix of globalization plus new technologies, including genetic, artificial intelligence and nano-bots. It is a post-nation state world. Speed, tailoring, flexibility and the capacity for movement are crucial in this image of the future. 􏰀4) The fourth is localization leading to a return of the past, a craving for the 1950s in the West and for earlier empires in the non-west. It is a search for times simpler, slower ± stability. These four images compete to be the world we would like to see. At the meso level what does this mean for transportation futures? I now analyse the scenarios generally from short, medium term and long term perspectives. In the triple bottom line/Gaian image, the changes required are foundational to the transport system. Transport is linked to health which is linked to sustainability. Who defines the future of transport is as important as the technologies used and the organizational structure that brings them about. Transport planning must be linked to land use policy to educational policy to labour trends. Engineering as well must become partnership based, focused not just on urban design, but on issues of sustainability. Becoming the global manager who has global portable skills is only part of the future, becoming a true globosapiensisfarmoreimportant􏰀Kelly,forthcoming).The actual system would be far less reliant on cars, far more on tele-commuting, and slower and micro forms of transport. Greening cars 􏰀for example, the possible development of a pollution-free car that runs on air and can be refuelled for less than $3, and costs less than $18,000 AUD 􏰀Massey, 2002)) would of course be a step forward in this future, but changing the grid that defines transport is far more important. Community making and building are thus crucial. For the car to be challenged, however, far more than traditional notions of the public will be required. The traditional view of the mass ± faceless, uniform ± has changed dramatically. There many ``publics'' from many worlds, the dot.com to the baby boomers, the new migrants and the old migrants and the indigenous. Public transport must become more tailored for the diversity that we exist within. Thus, just as the car is tailored for the individual, the public will have to become tailored for the diversity that is more and more constitutive of Australian society. Of course, in the short run the key is to reduce problems associated with traffic. In the USA, costs include $500 billion a year in deaths and injuries, plus congestion, sprawl, noise, loss of forests and farms, and carbon emissions 􏰀figures fromGreen:ThemagazineoftheAustralianGreens,2002). Further, the journal reports that: F F F each car 􏰀on average) is responsible for 820 hours of life lost through a road traffic accident fatality and 2,800 hours of life damaged by a road traffic accident. Statistically, one individual in every 100 will be killed in a road traffic accident and two out of every three injured 􏰀p. 25). Banning cars from central areas, cleaner fuels, fuel taxes, car sharing, coordinated transportation and land use policies go some of the way towards improving these figures. In the medium term the goal is to funnel new investments toward rail, bus, and bicycle infrastructure so that people have a variety of attractive, non-car choices, with less damage to the environment. In the long run, however, it is about creating car-free cities, as they offer a more sustainable, healthier, and happier future than any plan to ``improve'' the car or ameliorate its impacts. In the second image ± industrial realist ± essentially this is no fundamental change. At one level, transportation problems can be solved by tinkering here and there, adding new routes, diverting traffic, adding lanes during rush hours, fiddling with oil costs. At a secondary level, the key is integrated planning, aligning different modes of transport as well as integrated transport plans between government departments and other stakeholders. However, in this scenario, growth remains defining. The purpose of the transportation system is to ensure that economic growth continues and that this growth takes place efficiently ± making government, business and consumers happy. Experts know best. What has worked before will continue to work. Certainly, efficiency is required but good scenario planning can help us reduce risk and create a better system. Cars now, cars forever. Suburbs now, suburbs forever. The city continues its long-term trend towards anomie. Death by car is the price of progress. And, globally, it is stunning growth. ``More than 17 million cars are sold each year in the USA alone, and demand is surging in developing countries like China,where sales are expected to grow from 600,000 in 2001 to 2 million in 2010'' 􏰀Hamilton, foresight 5,1 2003 38 2002). Philip Morrison and Kosta Tsipis 􏰀1999) forecast that if current trends continue, there will be a billion private cars on the world's roads by 2050. In the third image, globalization of technologies leads to novel solutions. Even if these do not pan out, the focus will be on technology solving problems. In the short term this means:endinggridlockthroughGPS,tolls,activetraffic management 􏰀sensors), shared taxes, integrated bus system, and shared taxis. In the medium term, futurist Bob Olsen 􏰀2002a) argues that it will mean the development of dual modal transportation systems. Since people will not give up their cars 􏰀for efficiency and worldview reasons), a ``dual mode transportation system'' will result in transport that is safer, faster, cheaper, less stressful, and less polluting. Under such asystem,vehicleswillbeusedintwodistinctmodes:driven in the normal manner on the streets, and traveling automatically on high-speed dedicated guide-ways for trips of more than several miles. In the long term, this means, for example, the development of new technologies such as: PRT ± personal rapid transit ± with car-sized vehicles zipping all around on an ultra-light rail system that's computer controlled. You call for a vehicle on your cell phone. It comes to within a few blocks of you within a few minutes. You push a button for your destination, swipe your credit card, and you're off. There have been a few prototypes, but no systems like this yet built as far as I know. But this may be the ultimate in personalized ``boutique transit'' 􏰀Olsen, 2002b). In this sense the tech future will make the car even more tailored. The durability of the car has been its capacity to be both mass-produced and tailored, solving one of history's paradoxes:howtobemassandindividual.Asmentioned earlier, any public transport system that will gain the use of the public must be both public and individualized. Related to changes in transportation technology is of course a change in the nature of the city, seeing it becoming smarter, wired, and globalized. If we add medical breakthroughs, we can well imagine scenarios in which those with genetic predisposition to risky behavior 􏰀fast driving, thrill seeking) may be banned from driving cars, or monitors will be installed in their vehicles so they are unable to speed, or their insurance rates will be adjusted, or just as with paedophiles now, we will know when a reckless driver has entered the community. For a full extrapolation of the smart city, the smart car and smart transportation systems, the recent movie Minority Report does not seem far-fetched. The Fifth Dimension presents perhaps a more dystopian version, with the earlier Blade Runner giving an extreme dystopian version 􏰀all plausible, however). In the fourth perspective, Return to the Past, the challenge is to create stable communities with cars as the main means of individual transport between cities. A further challenge is to ensure that oil supplies are safe from terrorists and rogue nations. Cities have become too big and must be  decentralized. As well, government departments have become too big; power should be returned to communities. Of course, these images ± while distinct ± are not mutually exclusive; certainly the Gaian plus technology image results in the shift from the car to mobility. For example, ``Mobility for all'' could reduce environmental demand, increase accessibility, improve the quality of life of older and disabled people and offer new commercial opportunities to the very companies threatened by a reduction in traffic volume. However, images of the future and what they mean at the macro and meso level is not the full story. There is the push and the pull. The push is from new technologies such as GPS systems in cars; cars that turn off in case the driver has an inappropriate alcohol level; as well as bots that learn about the individual's behavior ± interactive, smart, learning bots to help one drive, and navigate. Other pushes includes a change in values, toward green values, largely spearheaded through cultural creatives. Aging also pushes the plausible future in particular directions ± towards technology suited for a less physically mobile population. And changes in transportation planning push the future in a different direction. Finally, along with the pull and the push is the weight. The weight is what makes change problematic. Such weights include silo-based transportation planning; lobby groups generally focusing on the car-road system, lock-in into our particular transportation modes; and the costs of developing alternatives. As well, weights comes from the deeper patterns of history ± historical limits that when reached force history to change. The question is, have we reached such a limit. Or can the industrial realist model find a way to continue? Will the world end in a traffic jam ± the worst case scenario if the industrial model fails and we have not created, invested, imagined, experimented with alternatives?

## TVT Mod-Link Wall—2

**The 1AC focus on catastrophic shocks assumes the status quo can be stabilized—This trades-off with the resilience required for infrastructure planning that can adapt to nonlinear change**

**Wilkinson 2012**

[Cathy Wilkinson, urban spatial planning at Stockholm Resilience Centre, Stockholm University, “Social-ecological resilience: Insights and issues for planning theory” Planning Theory May 2012 vol. 11 no. 2 148-169] Wilkinson 8

However, as mentioned already, social-ecological resilience is yet to develop a strong theoretical base for addressing matters of power, conflict, contradiction and culture (Evans, 2011; Hornborg, 2009: 255; Lélé, 1998; Nadasdy, 2007). This is essential for a critical account of the dynamics of change in complex urban systems and a substantial gap to be aware of in any attempt to translate social-ecological resilience to planning theory. The absence of such an account exposes social-ecological resilience to the criti­cism that it depoliticizes the dynamics of change in social-ecological systems, something planning theorists alert us to and caution against (Swyngedouw, 2010: 302). One specific area of interest for planning theory that emerges with respect to the way social-ecological resilience conceptualizes the dynamics of change regards the role of surprise, sometimes also called disturbance, crisis or shock in the social-ecological resil­ience literature. By ‘assuming change and explaining stability, instead of assuming sta­bility and explaining change’ (van der Leeuw, 2000) the attempt to ‘defeat disorder’ (Gleeson, 2008: 2658) inherent in traditional planning approaches is challenged and the ‘science of surprise’ is prioritized. With its central metaphor of the adaptive cycle, atten­tion is drawn in particular to the ‘backloop’ and the capacity to recover following sur­prises or disturbances. In a recent evaluation of how spatial strategies conceptualize space and place, Davoudi and Strange (2009: 224) conclude that ‘in all case study strate­gies a reasonably well-understood contemporary context is uncritically projected into a future sheltered from any radical or uncomfortable shocks’. They go on to generalize that ‘in the formulaic world of contemporary planning, there seems to be little room for nov­elty and surprise’ (Davoudi and Strange, 2009: 243). This is despite increasing attention to and examples of natural disturbances such as bush fires, flooding, earthquakes or heatwaves, and their often devastating impact on cities. Social-ecological resilience shows both how multiple or sustained disturbance reduces the resilience of social-ecological systems but also how disturbance can become the source of innovation (see Goldstein, 2009 and Pelling and Manuel-Navarrete, 2011). **Governance** *How does social-ecological resilience conceptualize governance?*  Social-ecological resilience is concerned with the governance of linked social-ecological systems. Generating adaptive capacity to cope with change is a central normative focus because the ability to be able to respond to the non-linear dynamics of change character­istic of complex adaptive systems is critical. Generating adaptive capacity relates both to matters of process and matters of substantive action. With respect to process, adaptive co-management is advocated. Adaptive co-management relies on rapid feedback of updated scientific information about the natural resource to inform adjustments to the management of the system by engaged stakehold­ers (Armitage et al., 2007). Four institutional prescriptions for adaptive co-management have been identified: ‘collaboration in a polycentric governance system, public partici­pation, an experimental approach to resource management, and management at the bioregional scale’ (Huitema et al., 2009). Adaptive co-management encourages collabo­rative learning and decision-making processes (Goldstein, 2009) and ‘safe-fail experi­ments’ (Ahern, 2011). Adaptive co-management remains an ideal whose effectiveness is yet to be proven (Huitema et al., 2009). It turns out that ‘despite the intuitive appeal of adaptive management, it has frequently failed in practice owing to social and institu­tional barriers (Stankey et al., 2003; Walters, 1997)’ (as cited in Fischer et al., 2009; see also Berkes et al., 2007). The wicked nature of many natural resource management pol­icy challenges presents significant barriers to achieving the aspired adaptability (Sandström, 2010) and challenges the somewhat ‘naïve’ belief social-ecological resil­ience places in institutional design to resolve tragedies of the commons in natural resource management (Goldstein, 2009). With respect to substantive action there are several ‘strategies for resilience’ that can be distilled from the social-ecological resilience literature and its as yet minimal applica­tion to urban systems (Ahern, 2011; Newman et al., 2009; Wardekker et al., 2009; Wilkinson et al., 2010). These relate strongly to the adaptive cycle and comprise ‘prac­tices that evoke change, that survive change, and that nurture sources for reorganization following change’ (Folke et al., 2005: 446). As detailed in Figure 1, the four broad ‘strat­egies for resilience’ are: to assume change and uncertainty; to nurture conditions for recovery and renewal after disturbance; to combine different types of knowledge for learning; and to create opportunities for self-organization. Early research in planning settings and with planning practitioners indicates these strategies for resilience prioritize different types of actions, including redundancy, adaptability and less-hierarchical approaches (Wardekker et al., 2009; Wilkinson et al., 2010). *How does this relate to the way planning theory conceptualizes governance?* Social-ecological resilience scholarship and the field of planning share an interest in col­laborative deliberation (Goldstein, 2009). Planning theory pays significant attention to collaborative planning as a way to deal with the limits of knowledge through process and dialogue (Forester, 1999; Healey, 2006; Innes, 1995; Innes and Booher, 2010). This assumption generates ongoing debate with planning theorists who challenge collabora­tive processes based on Habermasian assumptions of conditions for ideal speech and argue that such processes disguise the conflictual politics and power struggles inevitable in planning processes (Flyvberg, 1998; Flyvberg and Richardson, 2002; Huxley and Yiftachel, 2000). Drawing instead on Foucauldian notions of power and rationality, they encourage attention by those involved in governance processes to exercise reflexive situ­ated ethical judgements in face of power. Other planning theory scholars also argue that ‘planning theory should start from the assumption of a conflict model of society, rather than the prevailing consensus model’ and that ‘work in planning theory that argues for an “agonistic” view of society – the “permanence of conflict, non-reciprocity and domina­tion” (Hillier, 2003; p. 37) – has begun to move in this direction’ (Watson, 2009: 2267). As yet there is not an equivalent theoretical debate or awareness in the social-ecological resilience literature. Whilst not the primary focus of this paper, this is an area where resilience scholars would be well encouraged to seek insights from planning theory. The central dilemma of how to act in a relational world of constant dynamic non-linear change (or ‘becoming’) is shared by both social-ecological resilience and recent post-structural planning theorists, who also suggest ‘experimentation’ as a way forward and advocate the need to adaptively navigate towards desired trajectories (Hillier, 2007; see also Amin and Thrift, 2002; Murdoch, 2006). Social-ecological resilience pri­oritizes governance of natural resources through ‘learning by doing’ with ‘safe-fail’ experiments. This governance approach is highly dependent on technical information about the social-ecological system, the capacity to experiment and maintain feedback processes that can be acted upon. The role of what information and whose knowledge counts through such learning process is also a matter long discussed by planning theo­rists (Friedmann, 1987; Sandercock, 1998).

## TVT Mod-MPX Extinction—1

**The 1AC’s specific scenarios miss the big picture—They are like a six year old driving a car straight into the brick wall of human extinction—Patching up the current pathway blocks emergence of resilient systems that can adapt to complexity**

**Sanderson 2012** [Don Sanderson, architect “Transition Redux…” 3/6/12 <http://ukiahcommunityblog.wordpress.com/2012/03/03/don-sanderson-transition-redux/>

We are or soon will be pioneers stepping off onto unexplored frontiers, attempting to grow new sustainable-to-the-seventh-generation and resilient cultures while attempting to survive. Continuing to patch up the old one clearly will not be successful. Do we choose to randomly scatter seeds selected only with a hope and a prayer and have faith that some will grow? That seems to me to be foolish perhaps to the humankind’s death. It is often pointed out to aspiring entrepreneurs that most startups fail. We are facing the startup of all startups. Where can we go to receive master assistance? Well, maybe a master is too much to ask for, but remarkable journeymen exist here and there. Where have such cultures been successfully planted? There have been a few attempts. Consider the Ecovillage movement, consider the Mondragon cooperative in Spain. There are others scattered around here and there well worth examination. Which have features that may return the harvest we desire? I have thoughts, but no certainties. It is projected that we have little time to prepare, but if we do so foolishly, precipitously, why bother? We either will have time enough or we won’t. Let us suppose the former and begin to carefully, so carefully, lay a few stones on a foundation. In 2004, a conference was held at the Land Institute, Mayfield Green, Kansas. The articles presented there were collected in “The Virtues of Ignorance: Complexity, Sustainability, and the Limits of Knowledge” edited by Bill Vitek and Wes Jackson. In the introduction, Jackson describes tracing the roots of the conference’s theme back to a letter he received from Wendell Berry in 1982. After Jackson’s initial essay, Berry provided another entitled “The Way of Ignorance”, which has also been bound in a collection of his essays entitled, guess, “The Way of Ignorance and Other Essays”. Here, I believe, are our must-read, slap-on-the-head primers. Berry begins his essay, “Our purpose here is to worry about the predominance of the supposition, in a time of great technical power, that humans either know enough already, or can learn enough soon enough, to foresee and forestall any bad consequences of their use of that power. … When we consider how often and how recently our most advance experts have been wrong about the future, and how often the future has shown up sooner than expected with bad news about our past, [our] assessment of our ability to know is revealed as a superstition of the most primitive type. We recognize it also as our old friend hubris, ungodly ignorance disguised as godly arrogance. … A modern science … applied by ignorant arrogance resembles much too closely an automobile driven by a six year old or loaded pistol in the hands of a monkey.” What then must we do? He describes where we must begin in searching for answer, “Before going further, we had better ask what we humans need to know. We need to know many things, of course, and many kinds of things. But let us be merely practical for the time being and say that we need to know who we are, where we are, and what we must do to live. … We are not likely to be able to answer one of them without answering the other two. And all three must be answered before we can answer well a further practical question that is now pressing urgently upon us: How can we work without doing irreparable damage to the world and its creatures, including ourselves? Or: How can we live without destroying the sources of our life? These questions are perfectly honorable, we may even say they are perfectly obvious, and yet we have much cause to believe that the corporate mind never asks any of them.” How could our situation be captured more succinctly than this. It is too easy to throw up our hands, declare that the problem is too immensely complex, the world too mysterious, we only don’t know, and to return to making do, to patching the old bus with finger-crossed hopes it will carry us over the hump. I dare you to imagine a break through all those barricades that civilization has thrown up and guards so stoutly to a new world, a new culture, a new guiding myth, a new understand of who we are, where we are, why we are here, and, I add, what must we do. One thing is surely abundantly clear: the old monkey way of thinking is not going to suffice. Central to those that have been called the new sciences is the study of complexity. Everywhere we look, if we follow threads of relationships and flows, we find each supposed thing is inseparable from every other and feedbacks are adding confusion everywhere. Yet, in this great ocean of associations whirlpools somehow emerge while continually exchanging material and energy with their surroundings – some say they exchange information. Thus, all those galaxies, stars, planets, ecosystems, animals, plants, fungi, bacteria, and viruses around us as well as you and I have degrees of “alive” separable, enduring, resilient, and adaptive substantiality. How this happens remains a mystery, we might say “the” mystery. We either stand transfixed or, if there is to be a continued presence of humanity on the Earth more than for a brief burn-out moment, we urgently need a new way of thinking, a new more sensitive way of seeing to understand how emergence occurs so that we might facilitate the emergence of new sustainable cultures. Christopher Alexander proposed such. Alexander very early became intrigued with how such “whirlpool” emergence occurs and evolves. His search was to understand by what means might an architect proceed so that good building and urban designs would emerge from the immense number of possible ones. In the process, he began to look into complexity science in a depth hitherto not attempted by scientists. Alexander summarizes, “The situation is complicated by the fact that architecture itself … has been in an atrocious muddle intellectually. This muddle had to be cleaned up. And that was my main task during the last thirty years as a scientist; and as a builder of buildings and communities. (The huge difficulty in architecture were reflected in the ugliness and soul-destroying chaos of the cities and environments we were building during the 20th century – and in the mixed feelings of dismay caused by these developments at one time or another in nearly every thinking person, …). Trying to come to grips with these difficulties, required construction of new concepts, able to cope with the massive and complex nature of the difficulties, and able to focus a rational searchlight on questions that were, it seemed, largely beyond the reach of methods invented in other sciences. These difficulties arose, in part, I gradually discovered, from widespread but wrong-headed assumptions about the very nature of architecture – and in considerable part, too, from the dry positivist view too typical of technical scientific thinking in the modern era. But they also required new ways of thinking about issues which had not received much attention in the natural sciences …” As he probed in more depth, he became fascinated with complexity as a science; he set out to go further, to attempt to understand how to put emergence to work. I really don’t like to “go to town” and often feel wasted after returning. Why? I had concluded it had something to do with negative energy and yet strongly suspect this has an influence. Still, after reading Alexander, we drove to Ukiah and I was overwhelmed with how ugly it is, how like a patched up old bus. It is, certainly, matched by almost every other urban area of my experience in this regard. We personally live surrounded by nature, by natural beauty. The contrast is stunning. Christopher Alexander early recognized this and ask how it is that we distinguish this beauty, how we might plan beautiful architectures. He noted that we humans recognize the difference between beauty and ugliness. How so remains part of that great mystery, but he proposed to use humans as scientific instruments to determine goodness, fitness, of designs. Traditional scientists would, of course, declare his approach subjective nonsense, which he replies is silly. In fact, skilled human observers can be very powerful scientific instruments. The example of expert medical diagnosticians comes to mind; such persons have demonstrated the ability to recognize disorders that escape all our wonderful instruments. How so, none know, but Alexander is convinced it is related to intuition – yet another apparent subjectivity, traditional scientists’ scream. Aw, but, we are such fantastically complex beings far beyond the grasp of those scientists, which even most of them are coming to admit. Yet, so few of us are expert diagnosticians, expert architects, expert musical composers, or expert gardeners – expert instruments if you will. How is it we can become so skilled? Christopher Alexander created some methods for adapting designs progressively toward greater goodness, for learning if you will, based to an extent on his observations of natural growth. They are described in his four volume “The Nature of Order”, Alexander’s magna opus, which was published over the last decade. It is subtitled “An Essay on the Art of Building and the Nature of the Universe”. The books are separately titled, “The Phenomenon of Life”, “The Process of Creating Life”, “A Vision of a Living World”, and “The Luminous Ground”. Included are many photos of two hundred or more of his strikingly beautiful completed projects. These titles alone will surely give you a hint of what he has been undertaking. More clues, a list entitled “A New Kind of World” he wrote for the New York Times: A world in which we experience, daily, our unity with the universe. A world which is made like nature – and in which we are daily making nature. A world in which the daily process of making, adapting, and deepening is a vital part of our lives. A world in which there is something to believe in – not a religious thing – but a believable vision of God as the unity behind all things which guides us and impels us to act in certain ways. God not conceived of as a construct of any organized religion, but as a fact of nature and its wholeness. A social and political world which contains (and explicitly provides) the freedom for us to act in this way – something we rarely have today. A world in which we feel the cultural trace of human beings before us who made and loved every part. A world in which we value ourselves according to the beauty of the places we have carved out, and modified, and taken care of, and in which we have woven our lives together with that of other people, animals, and plants. A world in which buildings are shaped according to these principles, and laws governing the shaping of buildings in this way, are the laws most precious to us, and those to which we give most weight. A world in which we have an entirely new understanding of what it means for the world to be sustainable: not a technical matter, but a matter in which respect for the whole governs. Above all, there is a world in which meaning exists. The deadly and frightening state in which we do not know why we are here, is replaced by a world in which there is a natural and accurate and truthful picture – an answer to the question “why am I here” – one that is not made up, but that stems from and accords with the true nature of things. Alexander wondered if these same methods might be applied more widely, particularly to organizational structure. He asked if this had been done and was told it had been discussed, but no one had explored it further. As I read Alexander and view pictures of his creations, it dawned on me that I was looking at something very like Leonardo’s notebooks. He scares most architects with the breadth and depth of his thought and his focus on wholeness. Let us not be frightened. May Alexander’s methods provide well thought out ways to explore creating the sorts of good cultures of which we are in dire need? Yes, surely, if we greatly simplify what we are attempting to do. A culture is much, much more complex than a neighborhood. But, there is a rub. To understand Alexander without being deeply aware of, acutely sensitive to, Nature in all its enthralling profusion misses his point. Mother Nature ultimately calls the tune, not us no matter what we may think; if we intend to play with her, we’d better begin listening. We are very unlikely to hear her clearly in an urban area discordant with old-bus honking. I will go further, as I believe he would agree, that the means to be come a skilled instrument for judging the goodness of any design, say of a building, an organization, or a culture, begins with absorption in Nature in the wild. Thoreau was so right, “In wildness is preservation of the world.” This was seconded by Einstein, “Look deep into nature, and then you will understand everything better.” I could give you dozens of sources to read, dozens of ways to start, the good old civilized ways of learning. These will not work; there is no alternative other than that you get out of the bus, out of its sight, and lose your civilized self out there in the immense complexity, immense beauty of unplucked, uncooked, unprocessed, unpackaged, just raw Nature. Of course, you may say I’m a hypocrite and to an extent you are right. I’ve been such a slow student, only now in the process of graduating from kindergarten, but seeing glimpses of a fascinating future. How can it have taken so long? I can’t answer that. Certainly, I’ve received many shoves in the right direction throughout my life, but always found excuses and dilly dallied. I did manage to step off once for five years, sort of, before getting slapped down. My present justification is that at my age it is difficult to start from scratch, but I’m trying in every way I can to reform. Perhaps it is another rationalization, but it seems obvious to me that the design and formation of a new Earth-friendly human culture is a very, very, very hard problem. One may naturally emerge over the ages with everyone who survives doing their own thing, maybe after beginning again in the caves. Too dark? To not explore alternatives with the best available tools, such as especially Alexander’s, appears to me to be incredibly foolish – maybe to **human extinction**.

## TVT Mod-MPX Extinction—2

**We are in the midst of mass extinction, while the Euro Crisis and oil shocks show we can face quick systemic collapse at any moment—It’s ‘try or die’ for adaptability to complex threat**

**Tverbert 2011**

[Gail Tverbert, 9/12/11 “European Debt Crisis and Sustainability”

<http://ourfiniteworld.com/2011/09/12/european-debt-crisis-and-sustainability/>

I’ll also talk about a new bottleneck that humans seem to be reaching related to oil limits and financial crises that grow out of these oil limits, with the current example being the European Debt Crisis. Depending how this and other debt crises work out, it seems possible that human population will decline. If this should happen, it could lead to a reduced problem with species extinction. But the whole situation illustrates just how difficult attaining sustainability with world ecosystems is likely to be. Humans by their nature seem not to mesh well with world ecosystems. Unless humans become completely extinct, it seems likely that humans will always have difficulty living in a truly sustainable way. **The Sixth Mass Extinction** In the last 500 million years, there have been [five mass extinctions](http://www.rewilding.org/thesixthgreatextinction.htm), removing varying percentages of animal species. The last happened 65 million years ago, when dinosaurs became extinct. Biologist (including Michael Soulè and E. O. Wilson) have calculated that the current rate of extinctions is 100 to 10,000 times the background rate. [Niles Eldredge describes](http://www.actionbioscience.org/newfrontiers/eldredge2.html) the Sixth Extinction as follows: *Everywhere, shortly after modern humans arrived, many (especially, though by no means exclusively, the larger) native species typically became extinct. Humans were like bulls in a China shop: They disrupted ecosystems by overhunting game species, which never experienced contact with humans before. And perhaps they spread microbial disease-causing organisms as well.*Regarding agriculture, Eldredge states: *Agriculture represents the single most profound ecological change in the entire 3.5 billion-year history of life. With its invention: humans did not have to interact with other species for survival, and so could manipulate other species for their own use humans did not have to adhere to the ecosystem’s carrying capacity, and so could overpopulate*Homo sapiens *became the first species to stop living inside local ecosystems. All other species, including our ancestral hominid ancestors, all pre-agricultural humans, and remnant hunter-gatherer societies still extant exist as semi-isolated populations playing specific roles (i.e., have “niches”) in local ecosystems. This is not so with post-agricultural revolution humans, who in effect have stepped outside local ecosystems. Indeed, to develop agriculture is essentially to declare war on ecosystems – converting land to produce one or two food crops, with all other native plant species all now classified as unwanted “weeds” — and all but a few domesticated species of animals now considered as pests.*Now, with the advent of fossil fuels, we have been able to take our attack on ecosystems to a new higher level. I have previously shown how population greatly expanded, as the use of fossil fuels expanded in the last 200 years. It is difficult to even show population growth and fuel use on the same graph. They exploded at the same time, so the amounts overlay each other. **The New Bottle Neck** Fossil fuels in general, and oil in particular, enabled a great increase in food production. It is this increase in food production that has allowed world population to grow to nearly 7 billion. Recently, however, we have started experiencing a change. World oil production has not grown nearly as quickly as demand since 2005, leading to high oil prices. These high oil prices (and the high food prices that go with them) lead to recessions, and layoffs, especially in oil-importing nations. Governments try to fix these problems, by bailing out banks that have failed and by stimulating the economy, but find themselves in increasingly unacceptable debt positions. I have described these issues in [previous posts](http://ourfiniteworld.com/2011/08/15/oil-limits-recession-and-bumping-against-the-growth-ceiling/). The current situation is brittle. If there are severe financial dislocations, they could feed back and disrupt other systems, such as international trade and industrial agriculture. We could see political upheavals and reduced oil production, and because of all of these issues, reduced human food supply. The changes that may happen could be **quite sudden, much faster than one might expect**, if the Hubbert Curve were the only factor influencing the amount of oil available to society. **The European Debt Situation and Beyond** Clearly Greece has severe financial problems, and is near default, but European financial problems extend beyond Greece. Banks in other countries hold Greek debt. If Greece should default, banks outside Greece that hold Greek debt would stand to lose money, and would likely need to be bailed out. Otherwise, the many individuals with deposits in the banks would find themselves without the funds they had deposited. Businesses might not be able to pay their employees, if their funds are in a “bad bank”. If there is a default, countries vary in their ability to deal with it. If a country is outside the Euro, such as the UK or Switzerland, it can “print” more money, and can use these additional funds to recapitalize the banks in financial difficulty with freshly issued money. Thus they have a way around the problem, although it may result in some inflation. Countries that are part of the Euro have a bigger problem because they are more like an individual state of the United States. They use a common currency, so cannot themselves issue more currency. Unless they have a lot of funds available from other sources, it is difficult for them to recapitalize banks when there are defaults. EU countries have been arguing for months about how to solve the problem, but there is no easy solution, in part because the problem easily spreads from country to country, so it is a much larger problem than simply paying for defaults on Greek debt. It is likely that there would be defaults related to the debt of other PIIGS (Portugal, Ireland, Italy, Greece, Spain) countries as well. Some banks in France would also need recapitalization, because of loans they made. The EU itself is limited in the amount it has available to bail out countries with problems, and individual members object to spending huge amounts to bail out governments that are likely not to be able to pay back the debt. The European situation may eventually bring about the end of the Euro. If this should happen, we don’t know what the indirect impacts of this would be. A recent UBS publication talks this issue and mentions the possibility of civil disorder, saying: *Past instances of monetary union break-ups have tended to produce one of two results. Either there was a more authoritarian government response to contain or repress the social disorder (a scenario that tended to require a change from democratic to authoritarian or military government), or alternatively, the social disorder worked with existing fault lines in society to divide the country, spilling over into civil war. These are not inevitable conclusions, but indicate that monetary union break-up is not something that can be treated as a casual issue of exchange rate policy.*Whether or not the Euro situation leads to disorder, there are innumerable other debt problems around the world that are likely to get worse, as world oil supply gets tighter. Countries are likely to go back into recession, or see anemic job growth, and their governments will try to fix the situation. Eventually, the “borrow your way to prosperity” approach will have to end, either though debt defaults or through unwillingness of investors to purchase more debt. Over time, the debt “unwind” I have [talked about since early 2008](http://www.theoildrum.com/node/3382) is likely to grow and gather steam. As more states, cities, businesses, and individuals default on their debt, recession is likely to worsen. One of the questions in all of this is whether the international financial system withstand all of this disruption. If Greece defaults, and then pulls several larger European countries with it, how will this affect international trade? Even if this hurdle is passed, can debtors such as the United States and the United Kingdom continue with their high level of imports, if their financial condition continues to deteriorate? Perhaps the value of all of the OECD currencies will drop greatly, relative to non-OECD currencies, or countries will choose to trade only with trusted partners. If any of these things happen, trying to maintain the world’s current level of oil production and food production will become more and more of a challenge. Countries with debt problems are likely to find themselves unable to afford their prior level of oil imports, or will find trading partners unwilling to trade with them. **What Happens when the Current System Stops Working?** In a “normal” ecological situation, humans would have co-evolved with the plants and animals around them, so that stopping parts of the fossil fuel system would be no problem. Our current situation isn’t normal, though. We have found any number of ways to make our current way of life dependent on fossil fuels. At the same time, our way of life does not fit with our local ecosystems: Population has been allowed to grow far beyond what carrying capacity would support without fossil fuels. Big cities have been developed which allow germs to spread. Without fossil-fuel dependent pharmaceuticals and immunizations, diseases would greatly reduce populations. Land has been planted with large monocultures of plants. Animals have been specially bred for industrial agriculture. Special seed hybrids have been developed, and many varieties of crops that were grown in the past are no longer available. We have grown dependent on fertilizer and sprays for our crops. Modern medicine has effectively stopped “selection of the fittest.” Many people alive today depend on today’s medicines for their continued health. People have resettled to parts of the world where their genetics do not match up with the climate. For example, I am a blue-eyed blond, because my ancestors were Norwegian, but I live in Georgia (USA), which is a warm location. We have become dependent on our financial system, our international trade system, our electrical system, industrialized agriculture, the automobile, computers, and many other inventions and systems that depend on fossil fuels. Thus, if something like the financial crises that we are now seeing causes any of our major systems to fail, we are in danger of finding ourselves poorly adapted to the world around us, because we depend on fossil fuels in so many ways, and because we have spent so many years not evolving with the ecosystems around us. Exactly how things will work out is unclear, but there seems to be a possibility of a substantial reduction in human population. This change seems possible, because we are so poorly adapted to living in the areas around ourselves, if we lose any of our major systems, such as industrial agriculture. The fact that other systems (ocean acidification, climate change, water tables) are currently undergoing adverse change makes the situation worse.

## TVT Mod-MPX Extinction—3

**Bracketing the complexity of economy and ecology locks-in the path to global extinction.**

**Monroe 2006**

[Don Monroe, Don Monroe (www.donmonroe.info) writes on biology, physics and technology from Berkeley Heights, New Jersey. Prior to 2003, he spent 18 years in basic and applied research at Bell Labo- ratories.  “When Diversity Vanishes” SFI BULLETIN v. 23.1]

**Complex systems, from ecolo- gies to economies,** do interesting and unexpected things. Much of this rich behavior can be traced to the networks through which the underlying “agents” affect each other. Often, however, diversity of the agents themselves is es- sential. If they act too similarly, the entire system can cease to function. At the annual symposium of the Santa Fe Institute Business Network, No- vember 1–3, 2007, an array of experts explored this “diversity collapse” in contexts ranging from ecology and the food we eat, to finance and orga- nizational structure. **EColoGICal CollaPSE** The most dramatic diversity collapses are mass extinctions, which have wiped out much of life five times in Earth’s history. Doug Erwin, of the National Museum of Natural History and SFI, said that one of these, the end-Permian extinc- tion, wiped out “90 to 95 percent of everything in the oceans, about 70 percent of everything on land, and by all accounts was about the best thing that ever happened to life on Earth.” The extinctions made room for later innovation—but not right away. “Eventually the diversity got big- ger than before, but it took four million years to even get started.” In contrast to some observers, Erwin does not believe that we are entering a “sixth wave” of extinction. “At least if we’re lucky, we’re not,” he said. Nonetheless, “the crisis is real.” Erwin emphasized that there are many types of diver- sity, which do not have the same impact. For ex- ample, individual species on different branches of the tree of life forms can become extinct without substantial effect, but losing the same number of species on a single branch could eliminate that entire branch. Global extinction reflects the combined chang- es in smaller, individual ecosystems around the world. Andrew Dobson of Princeton University described what he called “probably the best-stud- ied” ecosystem: the Serengeti National Park in Tanzania. Established in 1951, this park and the surrounding areas provide “a natural example of what happens when we perturb an ecosystem,” he observed. Outside the park, the ecology changes dramatically because of farming and grazing. The difference is most notable at the highest trophic levels in the food chain, Dobson observed. Dobson contributed to the Millennium Eco- system Assessment, which framed the contribu- tions of healthy ecosystems, at least in part, in terms of the economic “services” they provide to people. Almost half of the value, Dobson said, comes from the most basic level, includ- ing bacteria, and another one third from plants. These lower levels also tend to be more resilient. Higher trophic levels, including grazers and predators, are more visible but provide less value, he said. They are also more sensitive to changes, so “monitoring these brittle species gives an early warning” of damage. “We have a scarily short time scale to under- stand how ecosystems collapse,” Dobson com- mented. “Most large natural ecosystems will be destroyed in the next 30 to 50 years. The quality of human life on this planet is dependent on the economic services supplied by those webs.” Historically, said Mercedes Pascual of the Uni- versity of Michigan and SFI, ecologists viewed complexity in food webs as an essential feature of healthy ecosystems that helps them to resist disruption. In contrast, monocultures, such as the endless fields of U.S. Midwestern corn, can succumb to a single pest. The important work of Robert May in the 1970s, however, showed that complexity actually reduces stability in some mathematical models. Ever since, Pascual said, ecologists have tried to understand “how more realistic structures lead to higher stability.”

## TVT Mod-AT-Predictions-1

**We their solve their predictions offense better— Political solutions to catastrophic risk requires imagining a world capable of adapting to complexity—Our evidence is comparative to their simplistic scenarios**

**Inayatullah 2003**

[Sohail Inayatullah, Prof at Tamkang U, “Alternative Futures of Transport” *foresight* 5.1: 34-43] Inayatullah 10

Conclusions First, once again your efforts at scenario planning should be commended. In times of technological transformation, long term projects become riskier. New technologies may make investing billions wasteful. Political transformations may dramatically change the price of oil. **The best way to reduce this risk, I believe, is not merely scenarios of alternative worlds, but developing an understanding of the depth of the future**; that is, going beyond the litany, clarifying the system, and the competing worldviews. **Understanding the vision of the future also reduces risk.** While the car and its accompanying road system is a modern miracle, there is dissatisfaction with it. I see this dissatisfaction in visioning workshop after visioning workshop. Individuals dream of car- free cities. They also yearn for neighborhoods, for the recovery of community, of meaning in life. This is a search for a new sort of community space, not the national public space, but something perhaps more intimate. 􏰀I wonder what the Gold Coast and the Sunshine Coast in South-East Queensland would look like if the private canals had been designed to be public. In one workshop, one planner imagined the Coast as an Australian Venice.) Our travel choices a generation ago were about individualism and profit. While these have not disappeared, another aspect of modern ``man's'' life now calls on ``him'' to connect. Perhaps this is the female aspect of modern man now speaking, searching for a different Australia, and a different transportation system to support it. However, as George Bush Sr has said, the American way of life is not negotiable. I am not so sure about the Australian way though. With more of us aware of the real costs of water, roads, and cars, alternatives that once seemed utopian now suddenly do not appearso.Initially,changeseemsinconceivable.However, over time it becomes impossible. And finally, the possible emerges. The first step on the road to a different future is imagining an alternative. Perhaps the future will be like the movie Minority Report, zooming cars, safe and secure, videophones, and the future used to control. Perhaps it will be otherwise.

## TVT Mod-Alternative

**Our framework solves their policy offense better—Resilience is a prerequisite to planning that can adapt to the complex web of existential threat**

**Wilkinson 2012**

[Cathy Wilkinson, urban spatial planning at Stockholm Resilience Centre, Stockholm University, “Social-ecological resilience: Insights and issues for planning theory” Planning Theory May 2012 vol. 11 no. 2 148-169] Wilkinson 9

*Issues for planning theory* I argue that one of the most pressing issues for planning theory regarding social-ecological resilience scholarship is to examine its implications for how governance of urbansystems is framed. Of course, one of the limitations in looking for insights from social-ecological resilience for planning theory with respect to governance is that there are few empirical studies researching a case in urban settings where a social-ecological resilience approach informed ongoing planning processes. This is somewhat surprising given the increasing importance of resilience as an urban policy discourse. Planning has been defined as the ‘framing of problems’ or ‘organizing attention to possibilities’ and the challenge of ‘how analysts organize attention (as) the central politi­cal problem of their practice’ (Forester, 1989: 19). As I have shown, social-ecological resilience frames governance challenges in particular ways. Social-ecological systems are linked. Social-ecological systems are complex adaptive systems. Resilience (defined in particular ways by particular people) becomes the normative goal to be pursued through adaptive co-management engaging various ‘strategies for resilience’. This fram­ing encourages a systemic, whole-of-systems perspective and a precautionary approach which preliminary empirical research with planning practitioners shows has significant potential to change mindsets and challenge the status quo (Wilkinson, unpublished*)*. However, at the same time there are several issues that planning theorists must be alert to here. The first concerns the object of governance, namely ‘social-ecological systems’. Evans argues that ‘seeing the city as a [social-ecological system] threatens to de-politicise urban transition, not so much by colonizing arenas of governance with expert knowledge (à la Modernism), but by constraining governance within a technocratic mode that remains inured to the tropes of scientific legitimacy’. A second issue concerns the mode of governance. By placing so much attention on experimentation, a social-ecological resilience approach is necessarily local in focus, even whilst it remains atten­tive to cross-scale issues. This precludes from view attention to deeper structural causes of problems and thus runs the risk of ‘fiddling whilst Rome burns’ (Vale and Campenalla, 2005, cited in Evans, 2011: 232). **Conclusions**  In this paper I explored the relevance of social-ecological resilience for planning theory by examining how the underlying assumptions of social-ecological resilience relate to planning theory. Three aspects are examined, namely human–nature relations, dynam­ics of change and governance. I argue that social-ecological resilience is of relevance for planning theory in several ways but that it is no panacea and must be critically examined. Social-ecological resilience scholarship holds the potential to contribute to addressing concerns of planning theorists that matters of substance have been overlooked. Despite human–nature relations and their spatiality being central to planning practice, planning theory hasn’t paid significant or sustained attention to the ecological dimension. Why is this so? And what can be done about this by planning theorists? With its origins in sys­tems ecology and emerging interest in the inter-disciplinary examination of the govern­ance of linked social-ecological systems, social-ecological resilience offers a field of scholarship of particular relevance for planning theory at a time when global ecological challenges require urgent attention. Social-ecological resilience highlights the intercon­nectedness and difficulty of governance of wicked problems in complex and linked social-ecological systems and ties this to the spectre of our shared survival. I argue that social-ecological resilience is worth more attention by planning theorists in a context where over two decades of effort on governing for sustainability hasn’t in any substan­tive ways stopped the decline in ecosystem services. It is the way social-ecological resil­ience frames the challenges facing linked social-ecological systems that holds interest for much-needed planning theory scholarship that places this as a central concern. How can more attention be paid to substantive matters, such as matters of ecology, in ways that sufficiently recognize the materiality of human–nature relations as well as sufficiently theorize the causes and potential sources for sustainable transformation? This is not a new challenge, but one to which I suggest social-ecological resilience can contribute.

## TVT Mod-AT-Cede Political

**The complexity framework is a prerequisite to influencing the policy implementation process—Rejecting their simplistic linear chain as ‘real evidence’ is the first step to sustainability**

Gill **Callaghan 2008**

[Research Fellow at Durham University School Applied Social Sciences, “Evaluation and Negotiated Order : Developing the Application of Complexity Theory” *Evaluation* Vol 14(4): 399–411]

 This article argues that complexity theory has the potential to bring   important insights in reframing of the role and practice of evaluation but   that the utility of complexity theory needs to be developed to support its   application in evaluation research. This article focuses on the implications of   a reformed relationship between theory and the empirical setting for what   we can learn in evaluating policy. It suggests that while complexity theory   provides a new way of looking at causal relationships and how we should   approach them, we need to develop complexity-consistent approaches to   understanding the interplay of agency and structure at the local level, the   level at which explanation is deemed possible in complexity theory. It is   proposed that the theory of negotiated order offers a basis to ﬁ ll that gap in   evaluation practice and to provide promise for theory-informed policy. Introduction  The problem of the relationship between social theory, both formal and substantive, and methods has been widely acknowledged and has become particularly acute given the recent emphasis on evidence as the basis for social policy   (Sanderson, 2003). The effect of government stress on achieving an evidence base   has been to reinforce a pre-existing divide between empirical and theory-based   social science knowledge, in which the call for evidence is associated with an objectivist standard, and against which other forms of research are found wanting.   This has reinforced a division in social policy implementation between conceptualization and the empirical evidence with which it should work. As a result there   has been a proliferation of empiricist studies, grounded in the methods of the   social sciences, without any consistent relationship to theory and related methodology (Walker, 2001). Theory-based evaluation has represented one approach to   address these issues but with limited success (Sanderson, 2003).  The problem is not simply one of failing to appreciate the insights available   through a range of social theories. It is that, more importantly, the failure to be   conscious of the ontological and epistemological basis of the knowledge derived   has not only led to the theory blindness that Walker describes, **but has undermined   the possibility of social science informing the policy implementation process.** The   real potential for using social science knowledge lies in a critical awareness of the   nature of the knowledge produced. The objectivist/empiricist approach to what   constitutes evidence represents a divergence which could eventually dispense   with social theory altogether in favour of technical methods. This appears to be   a growing trend, propelled in a move toward the ‘audit society’ (Power, 1997) as   government tries to employ linear ideas about implementation and associated   evaluation across the range of its functions. This article aims to suggest an alternative to empiricist local description which draws explicitly on complexity paradigms and allows us to build on the work of Sanderson (2000, 2002) and of Barnes   et al. (2003) on the relevance of complexity to evaluation. It further identiﬁ es a   potential for understanding the relationship of structure and agency in complexityconsistent terms through an approach to social theory based on Strauss’s work   on negotiated order. Working from this level of theory we can develop research   questions and devise the means for interpreting the qualitative data which is the   core data for much evaluative study.  From Weber onwards we have been aware that social science proceeds through   a critical examination of the, often implicit, value bases of phenomena in the social   world (Runciman, 1978). This is particularly important in policy, where the scrutiny   of innovation must comprehend the power and interests of a range of actors in   their relation to changing and contestable social structures. The questions that are   important are not, then, only whether the policy has technically achieved a desired   outcome, but how both the problem and the solution have been conceived and the   consequences of these conceptions for whose interests have been served and whose   interests suffered. Such issues are central to the question of policy sustainability   and lay bare underlying theories and values. Frequently because of their underlying   assumptions, policy researchers commit the error detected by Reed and Harvey in   the Parsonian approach of ‘tipping the hat’ to economic and ecological factors, ‘as it   rushed off to explore the cultural constitution of organisations’ (1992: 366).  The recent debate on the place of theory has been a response to these forces   and one important development has been the recognition of complexity theory   in providing us with an alternative way of understanding the world within which   attempts at engineering are designed (Byrne, 2001; Medd, 2001). This article will   seek to develop the argument for the explanatory role of this theory for understanding and evaluating such interventions based on achieving coherence between   ontological, epistemological understanding and substantive theory. It will argue   that these levels are mutually implicating and, in consequence, an explicit appreciation of their impact is important, not only for evaluation design, but for the   derivation and interpretation of ﬁ ndings. It will point to the value of complexity   theory as a framework but will argue that the account needs to be developed further if it is to have the tools to handle agency. Negotiated order can provide such   a complexity consistent account.

## TVT Mod-AT-Cede Political

**Our complexity framework is a prerequisite to political change—Their so-called ‘specific evidence’ abstracts predictions from the assumptions and values that makes their scenarios meaningful.**

**AND**

**The perm’s inclusion of their linear chain of internal links means ZERO SOLVENCY—Our framework cannot cannot incorporate perspectives that claim to fix complex problems through investments in a technical fix**

**Geels 2010**

[Frank W. Geels, Science and Technology Policy Research, University of Sussex “Ontologies, socio-technical transitions (to sustainability), and the multi-level perspective” Research Policy 39 (2010) 495–510] Geels 17

**4. Concluding remarks**The foundational reflections in this article have clarified the theoretical roots and assumptions of agency embedded in the MLP and produced directions for further theoretical extension. The article also provides a multi-disciplinary map for a broader and more reflexive study of socio-technical transitions. Such a broad map is particularly relevant for future sustainability transitions, which have three additional complexities compared to many historical transitions. First, sustainability is a normative goal and a collective good problem (with associated prisoner dilemmas and free rider problems). The former means that sustainability transitions will be full of debates about the relative importance of various environmental problems, which entail deep-seated values and beliefs. The latter means that private actors have no immediate incentive to address sustainability problems. Public authorities and civil society will therefore be crucial drivers for sustainability transitions. Their actions will need to change economic frame conditions and/or consumer practices, which subsequently incentivize private actors to reorient their innovation and commercial activities. Second, current transport, energy, agri-food and other domains are characterized by multiple ‘green’ niche-innovations. This variety deviates from many historical transitions that were characterized by one, two or sometimes three niche alternatives. It also raises difficult questions of directionality and choice between multiple transition pathways, especially since these will influence our future ways of life. One set of questions is how to assess and appraise the costs, benefits, and negative side-effects of various ‘green’ pathways? Such assessments not only entail incompatible criteria (e.g. the landscape influence of many wind turbines versus risks of nuclear energy), but also values which differ for various groups. Another set of questions is who makes the choices? Should this be done by governments, backed up by various experts, committees and technical calculations? Or should this be a more inclusive and participatory process, with broader stakeholders, societal groups and publics? The answer partly depends on one’s view of sus- tainability transitions. If these are seen as a technical challenge of developing and installing ‘green’ innovations, one may tend to the former answer. If these are seen as a broad social transformation process that also entails consumer behaviour and lifestyles, one may tend towards the latter. In both cases, however, legitimacy and public support will be important with regard to substantial financial investments and ‘policies that bite’ (e.g. higher taxes, stricter regulations). Narratives and discourses will therefore have to accompany investments, innovations and policies.  15 Rammert’s (1997) techno-structuration approach is promising in this respect, because it explores crossovers between constructivism, evolution theory and structuration theory. Using the analytical notion of local level (innovative projects) and global level (technological field), Rammert suggests a rethinking of technology studies that is: “Inspired by Giddens’s new rules of sociological method, a constructivist explanation of technology’s generation on the local level is combined with a social evolutionary approach of structural selection on the global level” (p. 171). 16 Also Shove’s practice theory may be less incompatible with the multi-level perspective than she suggests. Although Shove and Walker (this special issue) argue for a ‘flatter model characterised by multiple relations (rather than hierarchical levels)’, they also use notions such as ‘enduring and relatively stable practices’ and ‘trajectories’ (which refer to relatively stable and predictable structures). So, even within their practice approach it is possible to investigate relations between emerging fluid structures (such as London’s congestion charging) and existing stable structures. In that sense, there may be similarities with the MLP that could be further explored (rather than rejected outright). 508 F.W. Geels / Research Policy *39 (2010) 495–510*  Third, many of the new environmental problems (e.g. climate change, biodiversity, resource depletion) are global, not directly visible or tangible, and are mainly about the future. They therefore differ from other environmental problems (such as water pollution, smog, and acid rain), which were local, (relatively) immediate, visible and tangible. There were clear problem sufferers who could mobilize against specific problem causers, and ask for compensation or solutions. This is more difficult for the new environmental problems, where cause-effect chains are uncertain, problem causation more diffuse, and problem sufferers either distant in time (future generations) or in space (other countries). The mobilization for these kinds of problems will therefore depend to a large extent on social movements (often supported by concerned scientists) and public opinion. This is an additional reasonwhydiscourse, socio-political framing and debate are important in sustainability transitions. Innovation studies is well placed to address the topic of socio-technical transitions (see also Smith et al. in this special issue). Schumpeter (1934) already characterized innovation as multi-dimensional process involving changes in product, production process, markets, supplies/inputs, and organization. And the innovation systems literature conceptualizes innovation as distributed multi-actor process, paying attention to the co-evolution of technology, social networks and institutions. Innovation studies’ insights about the interactions between businesses, universities, governments, and markets/consumers remain important for the study of socio-technical transitions. But to address the analytical challenges around normativity, directionality, and social mobilization, innovation studies may need to broaden its analytical scope to include additional dynamics related to civil society, social movements and consumer behavior. Further crossovers to cultural studies, political economy, economic sociology and consumer studies may therefore be fruitful for a comprehensive study of socio-technical transitions to sustainability. One caveat to this call for opening up innovation studies is that various theories cannot be added up and combined as pieces in a puzzle. One needs to be reflexive about differences in theoretical traditions and underlying assumptions. In a recent assessment of the STIfield, Morlacchi and Martin (2009) made similar points, firstly arguing that the field faces epistemic challenges because it is an “intrinsically interdisciplinary, problem-oriented and pluralistic field” (p. 579), and secondly calling for “implicit assumptions and social theories need to be made explicit” (p. 579). The ontological discussion in this article has aimed to contribute to this, and make a multi-disciplinary assessment of fruitful crossovers regarding socio-technical transitions. The second caveat is that broader co-evolutionary frameworks should go beyond simple statements of ‘seamless webs’, ‘co-construction’, ‘complexity’ or ‘heterogeneity’, and delve deeper into the underlying causal mechanisms: “The challenge for [co-evolutionary] research here is to go to a much finer analysis at both empirical and theoretical levels, and to move from the statement that everything is coevolving with everything else to the identification of what is coevolving with what, how intense is this process and whether indeed there is a bi-direction of causality” (Malerba, 2006: 18). While the focus on patterns and mechanisms was already present in the MLP, this article aimed to further advance that agenda, by explicating various foundational mechanisms and how they relate (or not) to the MLP. While there are relevant calls to better operationalize the MLP (Genus and Coles, 2008; Markard and Truffer, 2008), I suggest that open frameworks are better suited to take this agenda forward than precise models (see also Smith et al. in this special issue). In that respect, I build on Porter (1991) who distinguished two approaches to theory building, the first being “situation specific but rigorous (read mathematical) models of limited complexity. Each model abstracts the complexity (. . .) to isolate a few key variables whose interactions are examined in depth” (Porter, 1991: 97). While such rigorous models are possible for demarcated topics that stay within one ontology, they face difficulties with broader, multi-dimensional and complex topics. In the latter case, frameworks or perspectives may be more relevant. “A framework (. . .) encompasses many variables and seeks to capturemuchof the complexity (. . .). Frameworks identify the relevant variables and the questions which the user must answer to order to develop conclusions tailored to particular industry and company. (. . .) In addition, all the interactions among the variables in the frameworks cannot be rigorously drawn. The frameworks, however, seek to help the analyst to better think through the problem” (Porter, 1991: 98). Genus and Coles (2008) characterize the MLP as heuristic. While they mean this as criticism, it can also be seen as a compliment in the sense that MLP frames the topic of transitions in a certain way and asks particular questions about patterns and mechanisms. For a new research endeavour this is an important task: “Problems are more important structurally than solutions, in that they can better muster the energy and interest of a community of intellectuals. This is not a facile paradox, for ‘problems’ do not present themselves spontaneously; the ability to raise questions already implies a conceptual scheme in which something is defined as an issue. It suggests at least the prerumblings of an emerging intuition of what the shape of that problematic world is like and puts us on a path to sharpening the focus of a full-scale paradigmatic vision” (Collins, 1986: 1346). The MLP is not a grand theory or unifying framework that synthesizes all available theories, but a middle range theory (Geels, 2007) that addresses a specific topic, is based on particular crossovers between evolution theory and interpretivism, and can perhaps be enriched with further crossovers to power theories and structuralism. But while the MLP is a flexible framework, it cannot (and does not want to) incorporate all social theories. Rational choice, functionalism, and relationism are rich ontologies that can generate alternative frameworks on (sustainability) transitions. Also other permutations and crossovers between social theories can probably generate relevant perspectives. I thus agree with Shove and Walker (2007) that the MLP need not be the ‘only model in town’. Transitions to sustainability form a rich and challenging topic that will not only remain socially relevant for decades to come, but may also benefit from dialogues between various approaches.

## TVT Mod-AT-Must work through state

**Our framework is a prerequisite to meaningful transportation policy debate—Bracketing complexity in favor of the 1AC’s ‘quick fixe’ reduces deliberation to vacuous simulation**

**Inayatullah 2003**

[Sohail Inayatullah, Prof at Tamkang U, “Alternative Futures of Transport” *foresight* 5.1: 34-43] Inayatullah 7-8

Causal layered analysis But agency is not just influencing the push, pull and weight, it is important to note that there are levels of the future. Policy making needs to not only be expanded through breadth via scenarios, in depth through visioning workshops, but also through layers of analysis. In terms of understanding the future of transport, four levels of analysis are crucial 􏰀see Figure 2). First is the litany. This is the most visible dimension of policy, of understandings of the future. The litany here includes forecasts of the number of cars, pollution levels, population growth, and the plethora of new technologies that will save the day. Second is the social, political, technological level ± this is the systemic view. Generally, policy is constructed at this level, taking into account the data of the litany level 􏰀problems as well as population trends). Integrated planning finds ways to ensure that the different parts of the system interact in ways that meet the need of stakeholders. The third level of analysis, the worldview level, is often forgotten. Most policy ignores this level of analysis, seeing it as stable and unalterable, or as unimportant or inaccessible. However, as demographics change and notions of ``we'' change, worldview is quite crucial. At a far less grand level, there are the worldviews or cultures of the different players in transportation futures: the automobile industry, urban planners, federal, state and local governments, citizens, to mention a few. Their cultures may be aligned or they may not be. Each tends to see the litany quite differently; for example, is the solution smarter cars or car free cities? Is the solution safeguarding oil fields or searching for alternative sources of energy? The myth/metaphor or the story level is the deepest and the longest term level of analysis. This is the unconscious dimension to why we do what we do, what we don't know we don't know. This is the car as more than simply about transport but about individual freedom, representing the Western way of life. At this level, roads are essentially about communication and trading, but also about ``citifying'' the earth, about man making his mark, and our relationship with nature ± living with it or conquering it. Let me give some examples. Examining the health and quality area, at the litany level, the data are horrendous: deaths caused by the medical system are the third biggest killer in the USA each year, accounting for between 60,000 and 100,000 deaths each year 􏰀National Academy of Science, 1999; Boodman, 2002; ABC Online, 2002). The litanysolutionistofindbetterGPsorcleanerhospitals,orFFF At the system level the solution is ensuring proper communication between the GP, the nurse, the hospital    administrator; that aisles are safe 􏰀tripping is a major source of breakages in hospitals); ensuring that the entire system communicates in seamless and safe ways based on the needs of the patient. At the worldview level, it is about challenging the expertise of the GP; problems arise because patients are disempowered. It is the vertical nature of allopathy that needs to be transformed. Different worldviews ± Naturopathic, Chinese, New Age ± thus offer healing alternatives. They solve the problem of the quality and safety of health in alternative ways. Deepest is the myth/metaphor level, about the nature of life and death, about risk and the modern technological system. The point is that policy should move up and down all these levels. As well, agency should be seen in the context of these multiple levels; agency is contextualized in the litany 􏰀the data), the system, the worldview and the myth/metaphor story. If one wants to understand and transform the world then transportation policy must be able to move up and down these multiple levels. Staying only at one level will lead to failure since the complexity of reality will not be addressed. Merely adding more roads as a solution to the problem of traffic jams is likely to only create more congestion in the long run. Integrating highways with trains with work schedules again will alleviate the problem in the short term; but the deeper issue is of city design, of suburbs, of sprawl. At the worldview level, we can develop policies based on different assumptions:forexample,theimagesofthefuture presented earlier. Each one constructs the litany differently ± a car-free solution; an integrated planning solution; a high- tech car solution; an connected villages solution. Each one leads then to a different scenario for the city.  Scenarios In research done for the Insurance Manufacturers Association, four scenarios were identified 􏰀Saul, 2002; Inayatullah, 2002a, b): 􏰀1)High-techworld:thesmartcityisintegratedwithsmart homes and smart cars. The key driver is new information and communication technologies 􏰀transformation via technology). The city ``senses'' through technology. Totally wired. 􏰀2)  Globalvillage:Thereisashiftfromindividualismto community and the environment. Non-economic values and deeper meaning become more important. The key driver is a values shift to spiritual perspectives 􏰀steady state plus Gaian transformation)  􏰀3)  City-based villages: inner cities villages are created, creating community via high density urban development. The key driver is the desire for community as well as the negative impacts of urban sprawl 􏰀steady state plus growth).  􏰀4)  Fortresscity:Thesystemnolongerworks,thuscitiesgo into protection mode. It is as well the return to core functions ± roads and sewage. Globalization, regional relationships and alliances stall. The key driver is failed globalization 􏰀return to imagined past).  foresight 5,1 2003 40 I present these scenarios not only to illustrate how worldviews and the drivers we focus on create different possible futures, but the necessity for updates. Scenario planning must be revisited over and over. This means testing the scenarios in a variety of ways. 8 Are there new emerging issues that are likely to impact on the relevance, validity and even accuracy of the scenarios? New emerging issues could be new technologies 􏰀nanotechnology) or cultural shifts 􏰀11 September 2001). 8 Are the variables used to incast the scenarios shared? That is, is STEEP the most appropriate variables or through action learning can others be developed that better reflect stakeholders concerns? 8 Are there new stakeholders whose views must be taken into account? 8 Has the preferred future shifted? 8 Are the scenarios lived? This last point is perhaps the most important. Many a report ends up in the office of dusty plans. This is partly because the scenarios are seen as either fantasy production, or because those that create them do so as planners and not as directors 􏰀as those that can create change, albeit this is a top-down perspective). Nor is authentic participation sought. For scenarios to be lived, we need to go back to the purpose offutures.Therearemultiplelevels:asstrategy,as education, as capacity building, as emergence, as memetic transformation. They must also be correlated with competing images of the future, with the pushes, and of course, the weight ± what is difficult to change. And, finally, depth is needed. Our travel choices are not merely litany ones. We are also changing systems by government policy. Worldviews and deeper stories frame policy. If we wish to understand where we are going, we have to understand the layers we live in, and the ways we constitute the futures through these layers.

## TVT Mod-AT-Need specific proposal

**Our framework builds capacity to learn and adapt to systemic risk—This solves better than specific predictions or policy ideas**

**Inayatullah 2003**

[Sohail Inayatullah, Prof at Tamkang U, “Alternative Futures of Transport” *foresight* 5.1: 34-43] Inayatullah 5

Finally, preferred futures also have forecasting efficacy in that we tend to create the futures we prefer. Multiple purposes of the future The future can be used and has multiple purposes. First, to develop strategy. Second, to gain citizen input, to gain participation. Third, as education. That is, the future serves as a way to train staff. Career planning, for example. Fourth, as capacity enhancement; that is, developing the capacity to think in terms of the long term, in terms of alternatives, for example. Thus, it is less important what the future will be or even what we want the future to be, than that the organization/society/civilization has the capacity to innovate, to learn about learning. Fifth, to move toward emergence, that is, toward the edge of order and chaos, where system transformation is possible. Sixth, as memetic organizational transformation; that is, the future is used to enter new memes in the organization that challenge old memes. We are seeing this in city futures in the move from the city as defined by the roads, rates and rubbish meme to that of the smart-international-green city. As well, if we examine the traditional organization, the dominating meme was: work nine to five, work hard, and retire 􏰀then die). A few decades ago, this changed somewhat because of globalization: upskilling and retraining along with adaptability and flexibility began to define the organization 􏰀downsizing was of course central to this). Most recently, the meme has become the learning organization. The new meme is the learning plus healing organization 􏰀taking into account employee's health, the impact of the organization on the environment; the organization as a family ± essentially, the triple bottom line approach). Whether it will be selected because of advantages it offers is not, however, clear at this stage. One possible emerging meme for transport is the individualized public, that is, public transport but tailored for the individual. This could be done through seating, or boutique buses, of seamless integration: To summarize, uses of the future: 8 Strategy. 8 Citizen input. 8 Education.

## TVT Mod-AT Policy Relevance

**Our complexity frameworks IS policy relevant—Resilience is uniquely important within the infrastructure context.**

**Wilkinson 2012**

[Cathy Wilkinson, urban spatial planning at Stockholm Resilience Centre, Stockholm University, “Social-ecological resilience: Insights and issues for planning theory” Planning Theory May 2012 vol. 11 no. 2 148-169] Wilkinson 3

Of course, both the domain of social-ecological resilience and the domain of planning theory are extensive and rapidly evolving, which is not unproblematic. A key challenge in engaging the resilience literature is that the concept of resilience has been extended to the degree that ‘both conceptual clarity and practical relevance are critically in danger’ (Brand and Jax, 2007: 22). This research is interested in social-ecological resilience. Social-ecological resilience is the ‘capacity of a system to absorb disturbance and reor­ganize while undergoing change so as to still retain essentially the same function, struc­ture and feedbacks, and therefore identity, that is, the capacity to change in order to maintain the same identity’ (Folke et al., 2010). The focus on social-ecological resilience is distinct from engineering resilience, social resilience or even ecological/ecosystem resilience (Adger, 2000; Folke, 2006: 259). The choice to focus on social-ecological resilience is deliberate as it is considered the most fruitful way to explore key gaps raised by planning theory scholars, in particular the need to pay more attention to matters of substance, and the specific call to address the implications of dynamic ecology in urban systems. This is not to say that other schools of resilience, including social resilience, community resilience and communicative resilience, are not of relevance for planning theory. Nor is it to deny the obvious relationships between them.

A key challenge in engaging the planning theory literature is that it means engaging with a fragmented and sometimes contradictory range of world views. In this respect a range of planning theories is drawn on, in particular those that share in some respect a non-linear or relational conceptualization of the dynamics of change, namely planning theories informed by complexity theories, post-structuralism and political economy. A distinction is made between critical planning theory (after Huxley and Yiftachel, 2000 and Flyvberg and Richardson, 2002) that is explanatory, analytical and conceptual and a descriptive or normative planning theory (see Yiftachel, 1989). In this paper, I pay atten­tion to both and insights from social-ecological resilience for planning theory, critical and normative, are sought (after Watson, 2003).

## TVT Mod-MPX Scenario-Autoclimate Sys

**It’s try or die for our complexity resilience framework—The current transportation-climate systems is racing to extinction.**

**Urry 2008**

[John, Sociology at Lancaster U, “Climate change, travel and complex futures” The British Journal of Sociology 59.2: 261-279] Urry CCTCF 1

In this paper I examine various sociologies of the future. I argue that one future, of global climate change, is now exceptionally signiﬁcant. This future is based upon certain sociological presumptions and thus sociology is central to its emerging contours and to its analysis. I examine one aspect of such a future, the role of travel and especially automobility within this emerging dystopia. I use some formulations from complexity theory to examine what might constitute an alternative to global heating and the scenario of ‘tribal trading’. It is suggested that one feasible alternative is a ‘digital panopticon’ and I examine some small changes that might tip the system to such a post-automobility system. But there is no free lunch here. It is argued that the world may be torn between two bleak scenarios as a consequence of the twentieth century’s exceptional degree of resource use, between a Hobbesian war of all against all and an Orwellian digital panopticon. The twentieth century would seem to be reaping its bitter revenge. Keywords: Climate change; surveillance society; travel; futures; complexity; consumption ‘the automobile . . . only fulﬁls its destiny: it is destined to wipe out the world’ (Ilya Ehrenburg, Russian journalist in 1929; quoted Monbiot 2006: 142) A society is a ‘partnership not only between those who are living, but between those who are living, those who are dead, and those who are [yet] to be born’ (Edmund Burke [1790] quoted Beinhocker 2006: 454) Predicting ‘futures’ Many sociologists and other social scientists have speculated about the future, developing various scenarios of future societies and future lives. These scenarios are generally based upon extrapolations of the present, seeing some particular feature in the present as the key to how people’s lives will unfold within the next few decades. Examples include Weber’s dark account of the emerging ‘iron cage’ of bureaucracy, Durkheim’s anxieties as to the future signiﬁcance of anomie or normlessness within social life, and Simmel’s extrapolations as to how life within the metropolis will increasingly entail systems of punctuality and the spread of a blasé attitude. And Marx too saw in steam power and the railway key harbingers of the future that would provide the conditions for the proletariat to become a ‘class-in-itself’ (Marx and Engels 1952 [1848]). Marx and Engels describe how: ‘the bourgeoisie has through its exploitation of the world market gives a cosmopolitan character to production and consumption in every country’ (1952: 46–7). This worldwide capitalist expansion will: ‘smash down Chinese walls’ and spread capitalist exploitation and hence the emergent proletarian class worldwide. Capitalist exploitation results in emergent effects of a revolutionary proletariat increasingly organized across the globe bringing about a ‘catastrophic’ branching of capitalism into a new emergent order of world communism. Marx further believed that it was the task of philosophy, or social science as we would now say, to help to change this exploitative bourgeois world and not just to analyse it: ‘The philosophers have only interpreted the world, in various ways; the point is to change it’ (Marx and Engels 1962 [1845]: 405). Marx sought to establish both the theory and the practice that would bring about the overturning of the capitalist system. But we now know that this analysis was ‘mistaken’ in predicting worldwide social revolution starting in the most advanced capitalist political economies. It started ﬁrst not in the most advanced economies but in Tsarist Russia; it did not involve a large organized proletariat; and it resulted not in communism or even socialism in one country but in a future worse than anything previously envisaged. This ‘failure’ to get the future right led much subsequent social science to eschew predictions of the future, to see visions of the future as ideologically serving the interests of speciﬁc social groups, and to critique utopias of alternative futures as dangerous and mistaken (Popper 1960; Kumar 1991). In the rest of this paper I use some insights from the complexity sciences to try to think the future in different ways. I seek to ‘think’ the future through the notion that the future is populated with various ‘complex adaptive systems’. There are various characteristics of the analysis of such complex systems that I now elaborate. First, such complex systems are seen as necessarily processual and ﬂow within time – time is not just a dimension along which systems move but all entities are constituted through their becoming, through process, through an arrow of time or the genie that is let out of the bottle and can never be put back (Whitehead 1929). Moreover, there is no tendency for systems to move towards equilibrium and hence the equilibrium models dominant in most economic system analyses are inappropriate (Beinhocker 2006: ch. 3; note Keynes’ realization of this when referring to the ‘chronic condition of subnormal activity’: Keynes 1936: 249). Thus we should not distinguish between equilibrium states and growth states – all systems are dynamic and demonstrate the power of the second law of thermodynamics, that physical and social systems move towards entropy (Beinhocker 2006: 66–7; see Malpas and Wickham’s critique of the notion that social systems move towards ‘social equilibrium’: Malpas andWickham 1995). Such powerful systems in the contemporary world are simultaneously economic, physical, technological, political and social.They thus possess emergent properties that are irreducible to any of these individual ‘factors’ (see Urry 2003). Moreover, there is increased interconnectedness or linking of system components through software, cybernetic architecture and a more general networked character of life – and such an increased scale of networked relationships produces more ‘system’ effects (Barabási 2002). Such systems are unpredictable as almost all systems pertinent in the social domain are open rather than closed, with energy and matter ﬂowing in and out (Prigogine 1997). Positive feedback mechanisms take systems away from equilibrium as shown in, for example, Keynes’ analysis of the positive feedback consequences of a fall in consumer conﬁdence (Keynes 1936). Thus systems are characterized by a lack of proportionality or ‘non-linearity’ between apparent ‘causes’ and ‘effects’ so that there can be small changes that bring about big system shifts (Nicolis 1995). But at the same time systems once established can get ‘locked in’ and hence survive for very long periods even though there appear strong forces that ‘should’ undermine such long term irreversibilities (Arthur 1994). The ordering of events are not ‘forgotten’ and hence ‘time matters’ in the development of events and systems (Abbott 2001). Overall systems adapt and co-evolve in relationship to each other and hence possible futures are irreducible to single ‘structures’, ‘events’ or ‘processes’(Wynne 2005) and where futures are messy and complicated (Law 2004). Each such system has to ﬁnd its place, to climb the peaks, within a ﬁtness landscape which predates its development and mode of adaptation (Kauffman 2003). More generally, thinking the future through this systems lens raises various signiﬁcant issues: what are the various systems and their interdependencies that bring about such futures, how effective social science can be in interpreting such futures, how to analyse the very long term and path dependent, how to avoid thinking in terms of equilibria, and whether and to what degree social science ought to be normative about alternative futures? 2 Resolving these issues in the contemporary moment is essential, environmentally, economically, governmentally, socially and intellectually. The social sciences have no ‘choice’ but to engage with various futures, to develop ‘sociologies of the future’. This is partly because there are now various methods for developing visions of futures, especially through scenario building and backcasting. But the main reason is because one particular vision of the future is now overwhelmingly signiﬁcant in terms of its implications for economic, social and Climate change, travel and complex futures  political futures of life upon earth. This is the thesis of global climate change and the multiple ways ‘social’ systems and processes have generated, and will apparently continue to generate, such temperature increases into the foreseeable future (Stern 2006). According to Monbiot this is the biggest of global issues, namely to stop temperatures rising more than a couple of degrees above their pre-industrial levels (Monbiot 2006: 15). And the ‘social’ is intrinsic to this analysis of a future of rising carbon emissions and temperature increases. This produces two utterly crucial major tasks for the social scientist. First, it is necessary to examine what sociologies of the future are being imagined in various scientiﬁc models and whether they are remotely plausible.The second task is to ask what possible alternative sociologies of the future can be imagined in which the consequence for rising global temperatures could be substantially reduced. These tasks I examine here but initially I make some further observations about sociology and ‘futures’.

# Block Module 2: Policy Pros!

## PolPros Mod-MPX-1

**We outweigh**

**First, MAGNITUDE—The PARADOX RISK turns their impact calculus UPSIDE DOWN—If your standard is a chain of plausible links, then existential risk becomes a race to the bottom**

**Kessler 2008**

[Oliver Kessler, Sociology at University of Bielefeld, “From Insecurity to Uncertainty: Risk and the Paradox of Security Politics” *Alternatives*  33 (2008), 211-232]

The problem of the second method is that it is very difficult to  "calculate" politically unacceptable losses.

If the risk of terrorism is  defined in traditional terms by probability and potential loss, then  the focus on dramatic terror attacks leads to the marginalization of  probabilities. The reason is that even the highest degree of improb-  ability becomes irrelevant as the measure of loss goes to infinity.^o  The mathematical calculation of the risk of terrorism thus tends to  overestimate and to dramatize the danger. This has consequences  beyond the actual risk assessment for the formulation and execution  of "risk policies": If one factor of the risk calculation approaches  infinity (e.g., if a case of nuclear terrorism is envisaged), then there  is no balanced measure for antiterrorist efforts, and risk manage-  ment as a rational endeavor breaks down. Under the historical con-  dition of bipolarity, the "ultimate" threat with nuclear weapons could  be balanced by a similar counterthreat, and new equilibria could be  achieved, albeit on higher levels of nuclear overkill. Under the new  condition of uncertainty, no such rational balancing is possible since  knowledge about actors, their motives and capabilities, is largely  absent.  The second form of security policy that emerges when the deter-  rence model collapses mirrors the "social probability" approach. It  represents a logic of catastrophe. In contrast to risk management  framed in line with logical probability theory, the logic of catastro- phe does not attempt to provide means of absorbing uncertainty.  Rather, it takes uncertainty as constitutive for the logic itself;

uncer-  tainty is a crucial precondition for catastrophies. In particular, cata-  strophes happen at once, without a warning, but with major impli-  cations for the world polity. In this category, we find the impact of  meteorites. Mars attacks, the tsunami in South East Asia, and 9/11.  To conceive of terrorism as catastrophe has consequences for the  formulation of an adequate security policy. Since catastrophes hap-  pen irrespectively of human activity or inactivity, no political action  could possibly prevent them. Of course, there are precautions that  can be taken, but the framing of terrorist attack as a catastrophe  points to spatial and temporal characteristics that are beyond "ratio-  nality." Thus, political decision makers are exempted from the  responsibility to provide security—as long as they at least try to pre-  empt an attack. Interestingly enough, 9/11 was framed as catastro-  phe in various commissions dealing with the question of who was  responsible and whether it could have been prevented.  This makes clear that under the condition of uncertainty, there  are no objective criteria that could serve as an anchor for measur-  ing dangers and assessing the quality of political responses. For ex-  ample, as much as one might object to certain measures by the US  administration, it is almost impossible to "measure" the success of  countermeasures. Of course, there might be a subjective assessment  of specific shortcomings or failures, but there is no "common" cur-  rency to evaluate them. As a consequence, the framework of the  security dilemma fails to capture the basic uncertainties.  Pushing the door open for the security paradox, the main prob-  lem of security analysis then becomes the question how to integrate  dangers in risk assessments and security policies about which simply  nothing is known. In the mid 1990s, a Rand study entitled "New  Challenges for Defense Planning" addressed this issue arguing that  "most striking is the fact that

we do not even know who or what will  constitute the most serious future threat, "^i In order to cope with  this challenge it would be essential, another Rand researcher wrote,  to break free from the "tyranny" of plausible scenario planning. The  decisive step would be to create "discontinuous scenarios ... in  which there is no plausible audit trail or storyline from current  events"52 These nonstandard scenarios were later called "wild cards"  and became important in the current US strategic discourse. They  justified the transformation from a threat-based toward a capability-  based defense planning strategy.53  The problem with this kind of risk assessment is, however, that

 even the most absurd scenarios can gain plausibility. By construct-  ing a chain of potentialities, improbable events are linked and brought into the realm of the possible, if not even the probable.  "Although the likelihood of the scenario dwindles with each step,  the residual impression is one of plausibility. "54 This so-called Oth-  ello effect has been effective in the dawn of the recent war in Iraq.

The connection between Saddam Hussein and Al Qaeda that the  US government tried to prove was disputed from the very begin-  ning. False evidence was again and again presented and refuted,  but this did not prevent the administration from presenting as the  main rationale for war the improbable yet possible connection  between Iraq and the terrorist network and the improbable yet  possible proliferation of an improbable yet possible nuclear  weapon into the hands of Bin Laden. As Donald

Rumsfeld  famously said: "Absence of evidence is not evidence of absence."  This sentence indicates that under the condition of genuine uncer-  tainty, different evidence criteria prevail than in situations where  security problems can be assessed with relative certainty.

## PolPros Mod-MPX-2

**Second Probability—Food security, financial markets, climate change, biodiversity, speculative bubbles—Interlocking threats emerge from complex systems, and specific shocks cannot be predicted until the crisis hits**

**B Subpoint: The 1AC TRADES-OFF with addressing the systemic factors driving us to catastrophe—Accounting for this uncertainty solves better than pinpointing isolated causes**

**Ramalingam 2011**

[1/11, Ben Ramalingam -Senior Research Associate at the Overseas Development Institute “The globalization of vulnerability”<http://aidontheedge.info/2011/01/11/the-globalisation-of-vulnerability/>]

…in the face of the global financial crisis a number of developing countries have proven to be remarkably resilient – *if judged purely in terms of economic growth*. At the same time, it appears that the burden of coping has been borne disproportionately by poor and vulnerable people. *This reality is poorly understood*…” (emphases added) In fact, much work on vulnerability has been traditionally undertaken in ‘disciplinary silos’ – in highly specialised ways which are often in isolation from each other. Environmental vulnerability is assessed by the climatologists, nutritional vulnerability by the food security experts, market vulnerability by the economists, disease vector vulnerability by epidemiologists, and so on. The precise nature of vulnerability is often also heavily debated, leading to differences *within* the silos. The gap between this ‘stove-piped’ understanding and multi-faceted reality becomes heightened when one considers the number of ongoing global crises. The financial crisis is just one of a number of global trends (that we currently know about) which are interacting and impacting on the lives of poor and vulnerable people. To take another example, the [2010 World Disasters Report](http://www.ifrc.org/Docs/pubs/disasters/wdr2010/WDR2010-full.pdf) focused on urbanisation, and found that “a high proportion of this urban growth is in cities at risk from the increased frequency and intensity of extreme weather events and storm surges that climate change is bringing or is likely to bring.” Along similar lines, [the global food system is showing signs of strain once again](http://www.srfood.org/images/stories/pdf/otherdocuments/20102309_briefing_note_02_en.pdf). Work done during the last upswing in prices in 2008 suggested that a key requirement was better monitoring and anticipation of future bubbles. Unfortunately anticipation has not led to preventative action. All the signs are that environmental disasters - driven by climate change - and a growing speculative bubble in commodities – driven partly by changing investor patterns in the wake of the financial crisis - are pushing the world into a new food price crisis. In the face of these trends and shocks, there is a slowly growing recognition that vulnerability itself has become globalised. Interestingly this insight has not come from within the aid sector but from organisations such as the World Economic Forum, whose [Global Risk Report 2010](http://www.weforum.org/pdf/globalrisk/globalrisks2010.pdf) shows that – like the world economy – vulnerabilities are now tightly interconnected. Global shocks and stresses have multiple, unpredictable effects and increasingly demand – but do not always trigger – diverse responses at the local level. As recent research indicates, employing language which Aid on the Edge regulars will recognise: Cause and effect in global systems is distinctly nonlinear. Inputs and outputs may not be proportional: a cause with ever-so-slightly different parameters than the previous instance might result in a wildly different effect. Additionally, systems and their component sub-systems interact to produce feedback loops that can either amplify or stabilize resulting effects. Feedbacks blur the line of what is cause and what is effect. The global system is characterised by various sizes and degrees of complexity combined into a tangled and heaving mass of interdependent actions. Despite these shifts in the nature of vulnerability, international aid policy and practice are still dominated by narrow, parochial approaches. Take for example the [findings of a report on chronic vulnerability](http://www.agricultureandfoodfordevelopment.org/BeyondAnyDrough%20Sahel%20District%2007.pdf) in Africa which found that much of the analysis undertaken by international agencies did not examine root causes and tended to divide vulnerability into immediate and structural issues. The agencies then focused their efforts on the immediate issues, allowing the structural issues to be largely ignored. By contrast, the reality of vulnerability for most poor people was found to be “complex and nuanced… vulnerability can be influenced by gender, ethnic group and generation issues, and by contemporary and historical social processes that *are often not analysed and not explained.*” (emphasis added) It would seem that it is only after things go seriously wrong that the inter-relationships between the key drivers of vulnerability become of importance to international agencies. To cite one prominent and very current example, the densely urban population in Port-Au-Prince was up until January 2010 experiencing high levels of vulnerability and multiple climactic shocks. It was only after the 12 January earthquake that aid agencies became sensitive to this interconnected reality, by which time it was already too late for many in Haitian population. As one satirical headline put it at the time: ‘Massive earthquake reveals poor country called Haiti to the world’. These examples give weight to the criticism I have made elsewhere – that the international community employs a ‘catastrophe-first’ model of lesson learning, which puts the emphasis on disasters striking before action is taken. There are often good practical reasons for this – anticipation is still in its infancy, prediction is largely impossible. However, without wanting to diminish these challenges, the key is to do much more in terms of changing our mindsets. As we argued in [an ALNAP study on humanitarian innovations](http://www.alnap.org/pool/files/8rhach3.pdf), there is a crucial need to find ways to move away from this catastrophe-first model of learning, towards *putting vulnerability first*. ***II: From ‘Catastrophe-First’ to ‘Vulnerability-First’ ~ Three Ideas*** This idea of putting vulnerability first has a number of possible implications, of which three are explored below. *Putting vulnerability first* requires a better, more inter-disciplinary, understanding of the globalised vulnerability landscape among both policy makers and operational decision makers. As well as better shared data and analysis, we need to find better ways of breaking down disciplinary silos. One way of doing this might be to examine how the ideas in one area might be transferred over to another. There is already some useful work in this direction, which seeks to generalise the work of the Intergovernmental Panel on Climate Change (IPCC). This suggests that vulnerability may be characterised as a function of three components: *sensitivity*, *exposure* and *adaptive capacities*. The UNFCC shows that such vulnerabilities can be understood through a combination of top-down modelling and scenarios with bottom-up, community-based approaches which recognise and build upon local knowledge and coping strategies. An interesting manifestation of this interdisciplinary approach in action is how the notion of ‘building back better’, a mainstay of disaster risk reduction, has found its way into the dialogue on the aftermath of the global financial crisis. *Putting vulnerability first* also means finding ways of communicating vulnerability understanding in ways that capture the political and humanitarian imagination alike. For example, some agencies have started using the evocative image of vulnerability defined as communities and individuals ‘living on the edge’. People are living on the edge if their lives and livelihoods are exposed and sensitive to shocks and stresses, and their adaptive capacities are constantly on the verge of being overwhelmed. Living *on* the edge suggests that a small push could send a community or individual *over* the edge. Being forced to live on the edge can have profound effects on the way people conduct their lives.

## PolPros Mod-MPX-3

**Third, TIME FRAME**

**We are in the midst of mass extinction, while the Euro Crisis and oil shocks show we can face quick systemic collapse at any moment—It’s ‘try or die’ for adaptability to complex threat**

**Tverbert 2011**

[Gail Tverbert, 9/12/11 “European Debt Crisis and Sustainability”

<http://ourfiniteworld.com/2011/09/12/european-debt-crisis-and-sustainability/>

I’ll also talk about a new bottleneck that humans seem to be reaching related to oil limits and financial crises that grow out of these oil limits, with the current example being the European Debt Crisis. Depending how this and other debt crises work out, it seems possible that human population will decline. If this should happen, it could lead to a reduced problem with species extinction. But the whole situation illustrates just how difficult attaining sustainability with world ecosystems is likely to be. Humans by their nature seem not to mesh well with world ecosystems. Unless humans become completely extinct, it seems likely that humans will always have difficulty living in a truly sustainable way. **The Sixth Mass Extinction** In the last 500 million years, there have been [five mass extinctions](http://www.rewilding.org/thesixthgreatextinction.htm), removing varying percentages of animal species. The last happened 65 million years ago, when dinosaurs became extinct. Biologist (including Michael Soulè and E. O. Wilson) have calculated that the current rate of extinctions is 100 to 10,000 times the background rate. [Niles Eldredge describes](http://www.actionbioscience.org/newfrontiers/eldredge2.html) the Sixth Extinction as follows: *Everywhere, shortly after modern humans arrived, many (especially, though by no means exclusively, the larger) native species typically became extinct. Humans were like bulls in a China shop: They disrupted ecosystems by overhunting game species, which never experienced contact with humans before. And perhaps they spread microbial disease-causing organisms as well.*Regarding agriculture, Eldredge states: *Agriculture represents the single most profound ecological change in the entire 3.5 billion-year history of life. With its invention: humans did not have to interact with other species for survival, and so could manipulate other species for their own use humans did not have to adhere to the ecosystem’s carrying capacity, and so could overpopulate*Homo sapiens *became the first species to stop living inside local ecosystems. All other species, including our ancestral hominid ancestors, all pre-agricultural humans, and remnant hunter-gatherer societies still extant exist as semi-isolated populations playing specific roles (i.e., have “niches”) in local ecosystems. This is not so with post-agricultural revolution humans, who in effect have stepped outside local ecosystems. Indeed, to develop agriculture is essentially to declare war on ecosystems – converting land to produce one or two food crops, with all other native plant species all now classified as unwanted “weeds” — and all but a few domesticated species of animals now considered as pests.*Now, with the advent of fossil fuels, we have been able to take our attack on ecosystems to a new higher level. I have previously shown how population greatly expanded, as the use of fossil fuels expanded in the last 200 years. It is difficult to even show population growth and fuel use on the same graph. They exploded at the same time, so the amounts overlay each other. **The New Bottle Neck** Fossil fuels in general, and oil in particular, enabled a great increase in food production. It is this increase in food production that has allowed world population to grow to nearly 7 billion. Recently, however, we have started experiencing a change. World oil production has not grown nearly as quickly as demand since 2005, leading to high oil prices. These high oil prices (and the high food prices that go with them) lead to recessions, and layoffs, especially in oil-importing nations. Governments try to fix these problems, by bailing out banks that have failed and by stimulating the economy, but find themselves in increasingly unacceptable debt positions. I have described these issues in [previous posts](http://ourfiniteworld.com/2011/08/15/oil-limits-recession-and-bumping-against-the-growth-ceiling/). The current situation is brittle. If there are severe financial dislocations, they could feed back and disrupt other systems, such as international trade and industrial agriculture. We could see political upheavals and reduced oil production, and because of all of these issues, reduced human food supply. The changes that may happen could be **quite sudden, much faster than one might expect**, if the Hubbert Curve were the only factor influencing the amount of oil available to society. **The European Debt Situation and Beyond** Clearly Greece has severe financial problems, and is near default, but European financial problems extend beyond Greece. Banks in other countries hold Greek debt. If Greece should default, banks outside Greece that hold Greek debt would stand to lose money, and would likely need to be bailed out. Otherwise, the many individuals with deposits in the banks would find themselves without the funds they had deposited. Businesses might not be able to pay their employees, if their funds are in a “bad bank”. If there is a default, countries vary in their ability to deal with it. If a country is outside the Euro, such as the UK or Switzerland, it can “print” more money, and can use these additional funds to recapitalize the banks in financial difficulty with freshly issued money. Thus they have a way around the problem, although it may result in some inflation. Countries that are part of the Euro have a bigger problem because they are more like an individual state of the United States. They use a common currency, so cannot themselves issue more currency. Unless they have a lot of funds available from other sources, it is difficult for them to recapitalize banks when there are defaults. EU countries have been arguing for months about how to solve the problem, but there is no easy solution, in part because the problem easily spreads from country to country, so it is a much larger problem than simply paying for defaults on Greek debt. It is likely that there would be defaults related to the debt of other PIIGS (Portugal, Ireland, Italy, Greece, Spain) countries as well. Some banks in France would also need recapitalization, because of loans they made. The EU itself is limited in the amount it has available to bail out countries with problems, and individual members object to spending huge amounts to bail out governments that are likely not to be able to pay back the debt. The European situation may eventually bring about the end of the Euro. If this should happen, we don’t know what the indirect impacts of this would be. A recent UBS publication talks this issue and mentions the possibility of civil disorder, saying: *Past instances of monetary union break-ups have tended to produce one of two results. Either there was a more authoritarian government response to contain or repress the social disorder (a scenario that tended to require a change from democratic to authoritarian or military government), or alternatively, the social disorder worked with existing fault lines in society to divide the country, spilling over into civil war. These are not inevitable conclusions, but indicate that monetary union break-up is not something that can be treated as a casual issue of exchange rate policy.*Whether or not the Euro situation leads to disorder, there are innumerable other debt problems around the world that are likely to get worse, as world oil supply gets tighter. Countries are likely to go back into recession, or see anemic job growth, and their governments will try to fix the situation. Eventually, the “borrow your way to prosperity” approach will have to end, either though debt defaults or through unwillingness of investors to purchase more debt. Over time, the debt “unwind” I have [talked about since early 2008](http://www.theoildrum.com/node/3382) is likely to grow and gather steam. As more states, cities, businesses, and individuals default on their debt, recession is likely to worsen. One of the questions in all of this is whether the international financial system withstand all of this disruption. If Greece defaults, and then pulls several larger European countries with it, how will this affect international trade? Even if this hurdle is passed, can debtors such as the United States and the United Kingdom continue with their high level of imports, if their financial condition continues to deteriorate? Perhaps the value of all of the OECD currencies will drop greatly, relative to non-OECD currencies, or countries will choose to trade only with trusted partners. If any of these things happen, trying to maintain the world’s current level of oil production and food production will become more and more of a challenge. Countries with debt problems are likely to find themselves unable to afford their prior level of oil imports, or will find trading partners unwilling to trade with them. **What Happens when the Current System Stops Working?** In a “normal” ecological situation, humans would have co-evolved with the plants and animals around them, so that stopping parts of the fossil fuel system would be no problem. Our current situation isn’t normal, though. We have found any number of ways to make our current way of life dependent on fossil fuels. At the same time, our way of life does not fit with our local ecosystems: Population has been allowed to grow far beyond what carrying capacity would support without fossil fuels. Big cities have been developed which allow germs to spread. Without fossil-fuel dependent pharmaceuticals and immunizations, diseases would greatly reduce populations. Land has been planted with large monocultures of plants. Animals have been specially bred for industrial agriculture. Special seed hybrids have been developed, and many varieties of crops that were grown in the past are no longer available. We have grown dependent on fertilizer and sprays for our crops. Modern medicine has effectively stopped “selection of the fittest.” Many people alive today depend on today’s medicines for their continued health. People have resettled to parts of the world where their genetics do not match up with the climate. For example, I am a blue-eyed blond, because my ancestors were Norwegian, but I live in Georgia (USA), which is a warm location. We have become dependent on our financial system, our international trade system, our electrical system, industrialized agriculture, the automobile, computers, and many other inventions and systems that depend on fossil fuels. Thus, if something like the financial crises that we are now seeing causes any of our major systems to fail, we are in danger of finding ourselves poorly adapted to the world around us, because we depend on fossil fuels in so many ways, and because we have spent so many years not evolving with the ecosystems around us. Exactly how things will work out is unclear, but there seems to be a possibility of a substantial reduction in human population. This change seems possible, because we are so poorly adapted to living in the areas around ourselves, if we lose any of our major systems, such as industrial agriculture. The fact that other systems (ocean acidification, climate change, water tables) are currently undergoing adverse change makes the situation worse.

## PolPros Mod-AT Cede the Political-1

**The complexity framework is a prerequisite to influencing the policy implementation process—Rejecting their simplistic linear chain as ‘real evidence’ is the first step to sustainability**

Gill **Callaghan 2008**

[Research Fellow at Durham University School Applied Social Sciences, “Evaluation and Negotiated Order : Developing the Application of Complexity Theory” *Evaluation* Vol 14(4): 399–411]

 This article argues that complexity theory has the potential to bring   important insights in reframing of the role and practice of evaluation but   that the utility of complexity theory needs to be developed to support its   application in evaluation research. This article focuses on the implications of   a reformed relationship between theory and the empirical setting for what   we can learn in evaluating policy. It suggests that while complexity theory   provides a new way of looking at causal relationships and how we should   approach them, we need to develop complexity-consistent approaches to   understanding the interplay of agency and structure at the local level, the   level at which explanation is deemed possible in complexity theory. It is   proposed that the theory of negotiated order offers a basis to ﬁ ll that gap in   evaluation practice and to provide promise for theory-informed policy. Introduction  The problem of the relationship between social theory, both formal and substantive, and methods has been widely acknowledged and has become particularly acute given the recent emphasis on evidence as the basis for social policy   (Sanderson, 2003). The effect of government stress on achieving an evidence base   has been to reinforce a pre-existing divide between empirical and theory-based   social science knowledge, in which the call for evidence is associated with an objectivist standard, and against which other forms of research are found wanting.   This has reinforced a division in social policy implementation between conceptualization and the empirical evidence with which it should work. As a result there   has been a proliferation of empiricist studies, grounded in the methods of the   social sciences, without any consistent relationship to theory and related methodology (Walker, 2001). Theory-based evaluation has represented one approach to   address these issues but with limited success (Sanderson, 2003).  The problem is not simply one of failing to appreciate the insights available   through a range of social theories. It is that, more importantly, the failure to be   conscious of the ontological and epistemological basis of the knowledge derived   has not only led to the theory blindness that Walker describes, **but has undermined   the possibility of social science informing the policy implementation process.** The   real potential for using social science knowledge lies in a critical awareness of the   nature of the knowledge produced. The objectivist/empiricist approach to what   constitutes evidence represents a divergence which could eventually dispense   with social theory altogether in favour of technical methods. This appears to be   a growing trend, propelled in a move toward the ‘audit society’ (Power, 1997) as   government tries to employ linear ideas about implementation and associated   evaluation across the range of its functions. This article aims to suggest an alternative to empiricist local description which draws explicitly on complexity paradigms and allows us to build on the work of Sanderson (2000, 2002) and of Barnes   et al. (2003) on the relevance of complexity to evaluation. It further identiﬁ es a   potential for understanding the relationship of structure and agency in complexityconsistent terms through an approach to social theory based on Strauss’s work   on negotiated order. Working from this level of theory we can develop research   questions and devise the means for interpreting the qualitative data which is the   core data for much evaluative study.  From Weber onwards we have been aware that social science proceeds through   a critical examination of the, often implicit, value bases of phenomena in the social   world (Runciman, 1978). This is particularly important in policy, where the scrutiny   of innovation must comprehend the power and interests of a range of actors in   their relation to changing and contestable social structures. The questions that are   important are not, then, only whether the policy has technically achieved a desired   outcome, but how both the problem and the solution have been conceived and the   consequences of these conceptions for whose interests have been served and whose   interests suffered. Such issues are central to the question of policy sustainability   and lay bare underlying theories and values. Frequently because of their underlying   assumptions, policy researchers commit the error detected by Reed and Harvey in   the Parsonian approach of ‘tipping the hat’ to economic and ecological factors, ‘as it   rushed off to explore the cultural constitution of organisations’ (1992: 366).  The recent debate on the place of theory has been a response to these forces   and one important development has been the recognition of complexity theory   in providing us with an alternative way of understanding the world within which   attempts at engineering are designed (Byrne, 2001; Medd, 2001). This article will   seek to develop the argument for the explanatory role of this theory for understanding and evaluating such interventions based on achieving coherence between   ontological, epistemological understanding and substantive theory. It will argue   that these levels are mutually implicating and, in consequence, an explicit appreciation of their impact is important, not only for evaluation design, but for the   derivation and interpretation of ﬁ ndings. It will point to the value of complexity   theory as a framework but will argue that the account needs to be developed further if it is to have the tools to handle agency. Negotiated order can provide such   a complexity consistent account.

## PolPros Mod-AT Perm-1

**The perm cannot overcome the link—Including the 1AC’s LOCKS IN the status quo linear model of transport planning**

**Dodder 2000**

[Rebecca Dodder, Technology and Policy Program at MIT “The Evolving Systems View of Transportation: Implication for Policy” <http://web.mit.edu/esd.83/www/notebook/Final%20Dodder.PDF>] Dodder 10

Building Systems  Closely intertwined with the methods and assumptions used for modeling the system, are the  processes and steps by which the transportation system is designed and planned? In particular,  how are alternative systems designs developed, and what are the variables and options available  for changing existing systems or creating new systems. In this respect, it is also illustrative to  question: who are the “system builders  5  , and what role to they play?”  Beginning in the late 1960s, many analysts were arguing for the expanded utilization of the  systems analysis framework for the urban transportation planning process (Catanese, 1972).  This approach promised a more systematic and rational approach, “with assumptions made  explicit, objectives and criteria clearly defined, and alternative courses of action compared in the  light of their possible consequences” (Catanese, 1972). Although the process was recognized to  be an iterative process, the basic approach entailed six stages: 1) problem formulation, 2) system  structure, 3) quantitative approach, 4) development of alternatives, 5) evaluation of alternatives,  and 6) interpretation. What will be argued here, is that the first three stages, which are related to  way in which the system is defined and modeled, to a large extent, determine the alternatives that  are developed.  Forecasting and Planning  For the purposes of planning for investment in urban transportation, network flows have  typically been projected as following well-specified patterns, usually with the forecast output  matching existing statistical behavior for trip demand. The demand for urban transportation has  been seen as roughly predictable enough to be forecast ten to twenty years into the future, so that  urban transportation improvements could be undertaken in order to satisfy that future demand.  These assumptions were in fact necessary, especially given the lumpy nature of investment in  capacity expansion. Furthermore, the models relied heavily upon assumptions of travel market     5   Thomas Hughes (1998) employs this term to describe the engineers that design systems.Defining the Transportation System 9  THE EVOLVING SYSTEMS VIEW OF TRANSPORTATION  equilibrium between the volume of services demanded and provided. These assumptions of both  a certain degree of predictability and linearity, while useful for such long-term planning as  infrastructure investments, also have the effect of locking in a systems to a particular trajectory  of development, and limiting less conventional planning options.  As noted in Haefner (1986), the effort involved in urban transportation planning can be roughly  decomposed into a demand side and a supply and evaluation side. On the demand side, the  analytical activities described above are important to provide a picture of the forecasted level of  demand for travel ten to twenty years into the future. While on the supply side, the focus is on  “which set of transportation improvements will best satisfy that demand” (Haefner, 1986). This  viewpoint - building a transportation system that responds to mostly exogenous changes to the  demand for transportation services - has implications for the planning process. Since this  framework separates the demand-generating variables from the process of transportation system  planning, it thereby restricts the set of options available to technology-related and operating  variables.  A similar distinction between demand-side and supply-side options can be seen schematically in  Manheim (1979). This diagram also illustrates the importance of the prediction models in  specifying cause and effect relationships between options and impacts.  Figure 2. Basic Prediction Models for  Transportation Options and their Impacts  Adapted from Figure 1.8 in Manheim (1979)  Manheim eloquently described the role of transportation system builders in the following  manner. “The challenge of transportation system analysis is to intervene, delicately and  deliberately, in the complex fabric of a society to use transport effectively, in coordination with  other public and private actions, to achieve the goals of that society” (Manheim, 1979, author’s  italics). Notwithstanding, for operational purposes, the options or “decision variables” for that  intervention, for designing transportation were typically much more blunt. The actual options,  while subdivided into “transportation options” and “activity options,” were almost entirely  restricted to the transportation options such as network structure and system operating policies.  In this sense, activity-system options, which relate to the drivers of aggregate demand for  transportation, were perceived as exogenous for the purposes of system design.  Within the policy arena of urban transportation systems, some analysts suggested that at least  until the early 1980s, the debate and analysis of policy options remained organized around  specific technologies and services.  OPTIONS  Technology Options  · Technology  · Networks  · Link Characteristics  · Vehicles  · System operating  policies  · Organizational policies  Activity Options  · Travel options  · Other activity options  IMPACTS  · User  · Operator  · Physical  · Functional  · Governmental  BASIC PREDICTION  MODELS  · Service model  · Resource model  · Equilibrium model  · Demand model  · Activity-shift modelDefining the Transportation System 10  “Analytic activities have tended overwhelmingly to focus on the  appraisal, advocacy, and/or incremental adaptation of these technologies  and services - which we term preselected solutions - rather than on  laying bare the character of the problems generating demands for public  action or on searching with a fresh eye for remedial strategies.  Paramount among these preselected solutions have been highway and  transit improvements, and policy discussions have typically proceeded as  if these were the only options available for addressing sources of  dissatisfaction with the urban transportation system” (Altshuler, 1981).  The question here is whether the particular systems view of urban transportation systems  fostered lock-in to certain categories of systems solutions, by foreclosing the potential appraisal  of options which dealt with factors not considered as integral or as manageable components of  the system.

## PolPros Mod-AT Perm-2

**The perm will not solve the links because complexity becomes an ‘AFTERTHOUGHT’ next to the 1AC’s simple story of change—This feeds collective biases towards applying linear narratives to complex systems**

Vivek **Neman 2011**

[economics graduate student at New York University

[http://aidwatchers.com/2011/01/aid-is-not-just-complicated-it%E2%80%99s-complex/](http://aidwatchers.com/2011/01/aid-is-not-just-complicated-it’s-complex/)

This maintains a series of collective illusions and overly simplistic assumptions about the nature of systems, about the nature of change, and about the nature of human actors. So the end result of all of this is that poverty, vulnerability, disease are all treated as if are simple puzzles. Aid, and aid agencies are then presented as the missing pieces to complete the puzzle. This not only gives aid a greater importance than perhaps it is due, but it also misrepresents the nature of the problems we face, and the also presents aid flow as very simple. Instead of engaging with complexity, it is dismissed, relegated to an afterthought, and the tools and techniques we employ make it easy for us to do this. We treat complex things as if they were merely complicated. What is the difference? As Ben goes on to explain, complicated systems can be modeled mathematically, but complex systems cannot.

## PolPros Mod-AT Predictions-1

**We do not reject individual predictions, but combining them FAILS in a COMPLEX system.**

**Extend Ramalingam**

**They trace a straight line from the status quo to their impact, and then back again to plan solvency—This involves dozens of moving parts…**

**[Insert examples]**

**But individual predictions trigger unpredictable effects—And feedback loops that reverse the lines of causality**

**They LOCK-IN BIASED HABITS of prediction because they carve out a LINEAR PATH of DISCONNECTED causes—But the WHOLE IS MORE THAN THE SUM OF ITS PARTS**

**We capture THEIR Predictions offense better by admitting what we do not know**

**Ramalingam 2010**

[Dec 13, Ben Ramalingam -Senior Research Associate at the Overseas Development Institute “The paradox of aid failures” <http://aidontheedge.info/2010/12/13/the-paradox-of-aid-failures/>

**One of the recurring themes here on Aid on the Edge of Chaos is that the complexity of real world systems is seldom recognised and acknowledged by international agencies, leading to systemic failures in aid policy and practice. The work of renowned policy analyst** [**Russell Ackoff**](http://en.wikipedia.org/wiki/Russell_L._Ackoff) **provides a useful way of unpacking these issues. Drawing on research undertaken among scientists and policy makers, Ackoff suggested there are different ways to frame a problem, each of which carries significant implications for how these problems are analysed and dealt with. The first level, messes, relates to systems or issues that do not have a well defined form or structure. There is often not a clear understanding of the problem faced in such systems, nor is there agreement about the solutions. Such systems often involve interconnected economic, technological, ethical and political issues. Ackoff suggests that all of the really important issues in the world start out as messes. For example, how will rising HIV/AIDS incidence in India be dealt with? This concerns money, technology, ethics, social relations, politics, gender relations, poverty, and all of these dimensions need to be dealt with simultaneously, and as a whole. Messes are also known more formally as wicked problems, and there is a growing literature on how to deal with these in different contexts. The next level is ‘problems’ – systems that do have a form or structure, in that their dimensions and variables are known. The interaction of dimensions may also be understood, even if only partially. However, in such systems, there is no single clear cut way of doing things. Instead, there are many alternative solutions, depending on the constraints faced. For example, dealing with the sewage system in a particular city may rely on amount of money available, technology, political stance of leaders, climatic conditions, etc. The final level is a puzzle, which is a well defined and well structured problem with a specific solution that can be worked out by analysis (Ackoff, 1974). In puzzles, agreement about both the definition of the issue and its solution is easy to reach. Analysing the financial position of an organisation might be such an issue. In much of modern science and policy, Ackoff identified a bias towards ‘puzzle solving’. He argued that the real-world, complex,  messy nature of systems is frequently  not recognised, leading to simple puzzle-based solutions for what are in fact complex messes. As another analyst has put it, some of the greatest mistakes are found when when dealing with a mess, when it’s dimensions are not seen in their entirety. Policy involves carving off a part of a mess, dealing with this part as if it were a problem and then solving it as  if it were a puzzle, all the while ignoring the linkages and connections to other dimensions of the mess (Pidd, 1996). This puzzle-solving bias is universal, transcending sectoral and disciplinary boundaries effortlessly. Click** [**here**](http://www.rff.org/Publications/WPC/Pages/10_01_07_GulfMexico_Zone_Scavia.aspx) **to see an application of this thinking to environmental issues in the Gulf of Mexico –** before **the BP spill. However, it arguably finds some of its most startling manifestations in the international aid realm. This is because while aid agencies face “perhaps the most complex and ill-defined questions facing human kind’ (Ellerman, cited in Roper and Pettit, 2002), their attitude toward the chance and risk inherent in their ventures is problematic to say the least. The issue is succinctly summarised in this account by Dr Randolph Kent, former head of the UN in Rwanda, Somalia and Kosovo: Venturing into the unknown normally means  that the organisation’s standard operating procedures can no longer deal with the types of  information it is receiving, and are no longer suitable. Such departures occur when the organisation is on the brink of collapse or is being forced – by means no longer in its control – to change its procedures fundamentally. It often takes a long time for an aid organisation to realise that it has hit the point where there is no alternative to change; often, that point comes too late’ (Kent, 2004). Of course, there are many reasons for this conservatism, and there are also growing accounts of how to make aid agencies more aware of and open to their failures. But there is a paradox here worth noting. Many of the mistakes made by aid agencies are well documented and repeated, on both the development and the humanitarian sides of the system. These mistakes often arise from the application of standard procedures with insufficient attention to the immediate context, to local capacity or to the historical roots of a given issue. And these mistakes come up time and time again in aid evaluations, to the extent that these key accountability mechanisms for the sector are almost unanimously seen as ‘telling us nothing new’. All too often, aid agencies echo the Peter Cook quip: ‘I have studied my mistakes carefully and at length, and I am pretty certain I can repeat them exactly’. So the issue is not, ‘how do we embrace failure’, but rather, how can we get aid agencies to abandon their existing – known, acceptable,** safe **– forms of failure? How can we get them to risk new and different, more innovative and unpredictable kinds of failure? To paraphrase Winston Churchill, the secret to success is to move from failure to failure with energy, enthusiasm, honesty and creativity. If this is true, then we can at least say that aid agencies are halfway there.**

## PolPros Mod-AT Predictions-2

**APPLES AND ORANGES—**

**We do NOT reject all predictions, but their decontextualized chain of linear causes is ANTI-KNOWLEDGE, especially for systems in flux.**

**Gurri 2011**

[Martin Gurri, Director of National Intelligence Open Source, [Sept 6 “Analyzing Events” http://thefifthwave.wordpress.com/2011/09/06/analyzing-events/]

I won’t dwell on the reasons produced by Watts to explain this delusion.  In brief,

we love to stretch common sense and Newtonian (or billiard-ball) causation beyond the breaking point.  When we fail, we take it for granted it was because of insufficient information.  This too is a failure of understanding.  It’s not that we lack enough information, it’s that no amount of information can ever be enough.

Human events unfold within complex systems governed by weird, nonlinear dynamics.  Prediction by means of billiard-ball mechanics is impossible, in principle.  Because each complex system develops in unique ways, events are also rarely susceptible to probabilistic analysis.  Rightly considered, a question like “Who will win the 2012 presidential elections?” refers to a single token.  There have been no previous 2012 presidential elections to average out with this one.

Of course, analysts persist in making predictions.  They are addicted to prophecy.  Tetlock proved that they guess right about as often as the flip of a coin, but it doesn’t matter.  This is what analysts do:  who they are.  The robe of the magus fits strangely on the scientist’s lab coat, but the point is clear.  These are the people who see into the future.  Unfortunately, to keep up the pose – to validate their expertise – they must insist that the future resemble the past.  They freeze yesterday, and imagine it’s tomorrow.  With an election, they point to polls.  They [say things](http://www.nytimes.com/2011/06/02/business/economy/02jobs.html?_r=1&pagewanted=1) like, “Since FDR, no president has been re-elected with an unemployment rate of 7.2 percent or higher.”  Prediction, explicit or implied, rests on arbitrary statistics and the assumption that nothing in the future will perturb the infinite number of variables pushing and pulling at the data.

## PolPros Mod-Narrative Bias Bonus

**Calculate the overall probability of the 1AC By MULTIPLYING the chance of Each Individual Prediction—For example 5 predictions that are each 50-50 have only a one in thirty-two chance of all being correct.**

**Their “specific scenarios” appeals to COGNITIVE BIAS towards simple stories—Drastically OVERESTIMATING the probability of multiple predictions being simultaneously true**

**[insert explanation]**

**They turn existential risk into a bed time story.**

**Yudkowsky, 2006** (Eliezer, research fellow of the Singularity Institute for Artificial Intelligence, Aug. 31, “Cognitive biases potentially affecting judgment of global risks”, Forthcoming in *Global Catastrophic Risks*, http://www.singinst.org/upload/cognitive-biases.pdf) [nw]

The conjunction fallacy similarly applies to futurological forecasts. Two independent  sets of professional analysts at the Second International Congress on Forecasting  were asked to rate, respectively, the probability of "A complete suspension of diplomatic relations between the USA and the Soviet Union,  sometime in 1983" or "A Russian invasion of Poland, and a complete suspension of diplomatic relations between the USA and the Soviet Union, sometime in 1983". The second set of analysts responded with significantly  higher probabilities. (Tversky and Kahneman 1983.) In Johnson et. al. (1993), MBA students at Wharton were scheduled to travel to Bangkok as part of their degree program. Several groups of students were asked how much they were willing to pay for terrorism insurance. One group of subjects was asked how much they were willing to pay for terrorism insurance covering the flight *from* Thailand *to* the US. A second group of subjects was asked how much they were willing to pay for terrorism insurance covering the round-trip flight. A third group was asked how much they were willing to pay for terrorism insurance that covered the complete trip to Thailand. These three groups responded with average willingness to pay of $17.19, $13.90, and $7.44 respectively.  According to probability theory, adding additional detail onto a story  *must* render the story less probable. It is less probable that Linda is a feminist bank teller than that she is a bank teller, since all feminist bank tellers are necessarily bank tellers. Yet human psychology seems to follow the rule that *adding an  additional detail can make the story more plausible.*  People might  pay more for international diplomacy intended to prevent nanotechnological warfare  *by China,* than for an engineering project to defend against nanotechnological attack  *from any source.* The second threat scenario is less vivid and alarming, but the defense is more useful *because* it is more vague. More valuable still would be strategies which make humanity harder to extinguish without being specific to nanotechnologic threats - such as colonizing space, or see Yudkowsky (this volume) on AI. Security expert Bruce Schneier observed (both before and after the 2005 hurricane in New Orleans) that the U.S. government was guarding *specific* domestic targets against "movie-plot scenarios" of terrorism, at the cost of taking away resources from emergency-response capabilities that could respond to *any* disaster. (Schneier 2005.) Overly  detailed reassurances can also create false perceptions of safety: "X is *not* an existential risk and you don't need to worry about it, because A, B, C, D, and E"; where the failure of any *one* of propositions A, B, C, D, or E potentially  extinguishes the human species. "We don't need to worry about nanotechnologic war, because a UN commission will initially develop the technology and prevent its proliferation until such time as an active shield is developed, capable of defending against all accidental and malicious outbreaks that contemporary nanotechnology is capable of producing, and this condition will persist indefinitely." Vivid, specific scenarios can inflate our probability estimates of security, as well as misdirecting defensive investments into needlessly narrow or implausibly detailed risk scenarios. More generally,  people tend to overestimate conjunctive probabilities and underestimate disjunctive probabilities. (Tversky and Kahneman 1974.) That is, people tend to overestimate the probability that, e.g., seven events of 90% probability will *all* occur. Conversely, people tend to underestimate the probability that *at least one* of seven events of 10% probability will occur. Someone judging whether to, e.g., incorporate a new startup, must evaluate the probability that many individual events will *all* go right (there will be sufficient funding, competent employees, customers will want the product) while also considering the likelihood that *at least one* critical failure will occur (the bank refuses a loan, the biggest project fails, the lead scientist dies). This may help explain why only 44% of entrepreneurial ventures3 survive after 4 years. (Knaup 2005.)  Dawes (1988) observes: 'In their summations lawyers avoid arguing from disjunctions ("either this or that or the other could have occurred, all of which would lead to the same conclusion") in favor of conjunctions. Rationally, of course, disjunctions are *much* more probable than are conjunctions.

## PolPros Mod-Narrative Bias Bonus

**Overcoming their biased habits of predictions is a prerequisite to reckoning with existential risk in the transportation context**

**Mangalagiu 2011**

[Diana Mangalagiu, Prof of Strategy at Smith School of Enterprise and Environment-University of Oxford “Risk and resilience in times of globalization” An emerging research program for Global Systems Science: Assessing the state of the art, 10/4/11, <http://www.gsdp.eu/>] Mangalagiu 2

In an application of the so-called ‘non-expected utility theory’, Geiger (2005) mathematically derives a statistical framework to evaluate the acceptance or acceptability of risks. He considers several examples of risk acceptance biases, one of them being an over-evaluation bias of catastrophic risks, which he defines as events with catastrophic consequences but low probability. Two explanations are considered for this bias. The first concerns a threat to an existing (certain) level of wealth for which even an improbable loss becomes unacceptable, and the second concerns an over-evaluation bias of low probabilities in general. The latter argument questions the utility of statistical risk acceptance models in the case of catastrophic events. Zwick (2005) studying risk perceptions in Southern Germany identifies a risk-switching effect, which could be an alternative explanation for an over-evaluation of catastrophic risks or at least hint at a way to avoid an over-evaluation of catastrophic events. Zwick finds that everyday risks are usually perceived as risky, but catastrophic or systemic risks are hardly seen as an immediate danger. This perception of risk changes, however, when systemic risks are mentioned deliberately (e.g. risks from emerging technologies). In that case the switching effect occurs and systemic or catastrophic events are perceived as more risky. Zwick concludes that for that reason quantitative data might be misleading in the evaluation of systemic risks, and thus should always be considered in connection with qualitative information on risk acceptance or perception.

So, systemic risks seem to be amplified by social processes and should thus be governed according to post-normal principles accepting ambiguity and implicit values. Holford (2009) went one step further making a philosophical argument that risk only arises from the classic way uncertainties and hazards are treated in our society. He argues that with the reductionist logic apparent in standard risk management approaches, the ambiguous nature of risk is suppressed, which in turn creates risk. So, when ambiguity in risk is not embraced, it might be that we will live in a society preoccupied with risk as manifested by Beck. 8

**3. Overview of risk assessment and risk management practices**

Today, risk assessment and management practices have extended in nearly every sphere and facet of life in the industrially developed economies. From early origins in shipping, modern risk management approaches have continued to enable new forms of enterprise by aiming to strike an appropriate balance between opportunity and loss, winners and losers. Risk analysis methods and tools have continued to be shaped by the emergence of probability theory in the 1930s and the more recent availability of cheaper computation power.

Across the world, decision makers and thought leaders, in business, leading institutions and in governments, are challenged to ensure continued progress and success in the context of low predictability and more turbulent and unexpected change.

Professional practices have grappled for decades with the challenges of harnessing hard facts and intuitive or anticipatory knowledge in preparing for the future and decision-making under uncertainty. Yet despite ever more sophisticated and extensive approaches to risk assessment and management, in 2002, the European Environment Agency published a study entitled ‘Late lessons from Early Warnings’. The study notes the growing innovative powers of science seem to be outstripping its ability to predict the consequences of its applications, whilst the scale of human interventions in nature increases the chances that any hazardous impacts may be serious and global.

In 2003, the Riskworld scenarios (Eidinow et al., 2003; Wilkinson et al., 2003) have posed the question how risk will be governed in future and who will take the lead in risk governance. They consider three possible futures: expert rules (rational risk management), common sense (shared meaning and discursive risk management), and kaleidoscope (reflexive and adaptive risk management). While those scenarios have not been exclusively concerned with systemic risk, after the publication of Riskworld, several authors have touched on the assessment, management, and communication of systemic risk in public and private spheres.

Two studies have looked at the general role science will play for systemic risk assessment and how reliable assessments can be achieved. As part of the Millennium project Glenn & Gordon (2004) discuss the future challenges of science and technology over the next 25 years in the face of accelerating technological innovation combined with increasing public awareness of dangers and risk arising from it. One aspect of their work considers the role it can play in managing catastrophic risks. Summarizing comments of 237 scientists they find that science might help to avoid certain catastrophes such as energy crisis, climate change, terrorism, epidemics, and regional warfare over natural resources. Also, policy makers could prevent societies from taking catastrophic risks, e.g. with a UN agreement. Ord et al. (2010) question the traditional risk assessment methods of high impact but low risk events. They argue that to obtain reliable risk estimates it is necessary to deal with errors in theory, in model, as well as in the calculation of probabilities, as any risk assessment can only be as good as the underlying model assumptions and arguments. For the same reason they see the threat of marginalizing high impact events due to their low probability based on solely one standard model.

## PolPros Mod-Narrative Bias Bonus

**Linear predicitons fail, resulting in existential catastrophes**

**Yudkowsky, 2008** - Research Fellow at the Singularity Institute for Artificial Intelligence (Eliezer, “Cognitive biases potentially affecting judgment of global risks”, peer edited by the Singularity Institute, <http://singularity.org/files/CognitiveBiases.pdf)//BZ>

Taleb (2004) suggests that hindsight bias and availability bias bear primary responsibility for our failure to guard against what Taleb calls Black Swans. Black Swans are an especially diﬃcult version of the problem of the fat tails: sometimes most of the variance in a process comes from exceptionally rare, exceptionally huge events. Consider a financial instrument that earns $10 with 98% probability, but loses $1000 with 2% probability; it’s a poor net risk, but it looks like a steady winner. Taleb (2001, 81–85) gives the example of a trader whose strategy worked for six years without a single bad quarter, yielding close to $80 million—then lost $300 million in a single catastrophe. Another example is that of Long-Term Capital Management, a hedge fund whose founders included two winners of the Nobel Prize in Economics. During the Asian currency crisis and Russian bond default of 1998, the markets behaved in a literally unprecedented fashion, assigned a negligible probability by LTCM’s historical model. As a result, LTCM began to lose $100 million per day, day after day. On a single day in 1998, LTCM lost more than $500 million (Taleb 2004). The founders of LTCM later called the market conditions of 1998 a “ten-sigma event.” But obviously it was not that improbable. Mistakenly believing that the past was predictable, people conclude that the future is predictable. As Fischhoﬀ (1982) puts it: When we attempt to understand past events, we implicitly test the hypotheses or rules we use both to interpret and to anticipate the world around us. If, in hindsight, we systematically underestimate the surprises that the past held and holds for us, we are subjecting those hypotheses to inordinately weak tests and, presumably, finding little reason to change them. The lesson of history is that swan happens. People are surprised by catastrophes lying outside their anticipation, beyond their historical probability distributions. Why then are we so taken aback when Black Swans occur? Why did LTCM borrow $125 billion against $4.72 billion of equity, almost ensuring that any Black Swan would destroy them? Because of hindsight bias, we learn overly specific lessons. After September 11th, the U.S. Federal Aviation Administration prohibited box-cutters on airplanes. The hindsight bias rendered the event too predictable in retrospect, permitting the angry victims to find it the result of “negligence”—such as intelligence agencies’ failure to distinguish warnings of Al Qaeda activity amid a thousand other warnings. We learned not to allow hijacked planes to fly over our cities. We did not learn the lesson: “Black Swans occur; do what you can to prepare for the unanticipated.” Taleb (2004, 7–8) writes: It is diﬃcult to motivate people in the prevention of Black Swans. . . . Prevention is not easily perceived, measured, or rewarded; it is generally a silent and thankless activity. Just consider that a costly measure is taken to stave oﬀ such an event. One can easily compute the costs while the results are hard to determine. How can one tell its eﬀectiveness, whether the measure was successful or if it just coincided with no particular accident? . . . Job performance assessments in these matters are not just tricky, but may be biased in favor of the observed “acts of heroism”. History books do not account for heroic preventive measures.

## PolPros Mod-Narrative Bias Bonus

**NARRATIVE BIAS cannot be wished away—Adopting our interpretation as a DECISION RULE is a prerequisite to accurate predictions.**

**Mauboussin 2011**

[September Michael J. Mauboussin, chief investment strategist at Legg Mason Capital Management, also teaches at Columbia Business School, “Embracing Complexity” Harvard Business Review September 2011]

A complex adaptive system has three characteristics. The first is that the system consists of a number of heterogeneous agents, and each of those agents makes decisions about how to behave. The most important dimension here is that those decisions will evolve over time. The second characteristic is that the agents interact with one another. That interaction leads to the third—something that scientists call emergence: In a very real way, the whole becomes greater than the sum of the parts. The key issue is that you can’t really understand the whole system by simply looking at its individual parts.  Can you give us a concrete example? A canonical example of a complex adaptive system is an ant colony. Each individual ant has a decision role: Am I foraging? Am I doing midden work? Each one also interacts with the other ants. A lot of that is local interaction. What emerges from their behavior is an ant colony.  If you examine the colony on the colony level, forgetting about the individual ants, it appears to have the characteristics of an organism. It’s robust. It’s adaptive. It has a life cycle. But the individual ant is working with local information and local interaction. It has no sense of the global system. And you can’t understand the system by looking at the behavior of individual ants. That’s the essence of a complex adaptive system—and the thing that’s so vexing. Emergence disguises cause and effect. We don’t really know what’s going on.  Why is an ant colony the first example you think of? Complex adaptive systems are one of nature’s big solutions, so biology is full of great examples. Ant colonies are solving very complicated, very challenging problems with no leadership, no strategic plan, no Congress.  Once you’re aware of how the structure works, though, you’ll see these systems everywhere—the city of Boston, the neurons in your brain, the cells in your immune system, the stock market. The basic features—heterogeneous agents, interaction, and an emergent global system—are consistent across domains.  Why should businesspeople pay attention? So what could a biologist or an ant specialist or a honeybee specialist possibly tell us about running businesses? The answer is, a whole lot more than you might guess, if you are willing to make some connections. This to me is an essential way to think—especially in the 21st century.  “What could a biologist tell us about running businesses? A lot—if you’re willing to make some connections.”  Consider capital markets. Rather than looking at them through the rational-expectations model, or even using the no-arbitrage assumption—the idea that you won’t find any $100 bills on the sidewalk because somebody has already picked them up—you can look at them through a complex adaptive systems model, which empirically fits how the markets work. But complexity doesn’t lend itself to tidy mathematics in the way that some traditional, linear financial models do.  What are the dangers of misunderstanding complexity? In the late 1800s rangers at Yellowstone National Park brought in the U.S. cavalry to try to improve the game population by hand-feeding elk. The elk population swelled, and the elk started eating aspen trees, and aspen trees were what the beavers were using to build their dams, and the beaver dams caught the runoff in the spring, which allowed trout to spawn. More elk equaled less trout.  That one choice, feeding the elk, led to a series of cascading events that were completely unanticipated. People seek to improve complex adaptive systems, sometimes with disastrous consequences. It doesn’t take a lot of effort to make the leap from elk to the economy. People really have the best of intentions. But there is no way they can anticipate the ultimate results.  The question, then, is What conditions have to be in place to actually solve these kinds of challenging problems? That spills over to organizations very quickly.  What prevents us from dealing effectively with complexity? The biggest issue, in my mind, is that humans are incredibly good at linking cause and effect—sometimes too good. Ten thousand years ago most cause and effect was pretty clear. And our brains evolved to deal with that.  But it means that when you see something occur in a complex adaptive system, your mind is going to create a narrative to explain what happened—even though cause and effect are not comprehensible in that kind of system. Hindsight’s a beautiful thing.  Also, we have a tendency to think that certain causes will lead to particular effects. That’s our Yellowstone story. And we just don’t know. I think that’s the biggest single bias.  What else gets in the way? First, we tend to listen to experts, although it’s been well documented that expert predictions are quite poor. But they’re authoritative, so we listen to them, even when we know that these people are predicting something that’s fundamentally hard to predict. The individual who comes across as more authoritative is actually more believable. People are much more comfortable deferring to the person in the pinstripe suit with the PowerPoint slides.  Second, we’re reluctant to share private information, so we aggregate information poorly. In one study the researchers gave team members shared information about the same three candidates, but also gave each member a unique piece of information about one candidate. If the team members shared all the unique information, they would choose the best-qualified candidate. If they used only the information common to all of them, they would pick the wrong candidate. A vast majority of the time, they selected a suboptimum candidate. Why? Because they chose to talk about the shared information and to reserve the unique information. Committees are not optimized to share private information. So even in organizations where the information exists, it’s not being surfaced.  **What do these naturally occurring systems teach us about how to deal with complexity?**   When information is diverse and aggregation and incentives are healthy, you get very good answers to problems. That's what nature is doing, and that's what we have to learn to do more effectively. **How do you translate that specifically into management?**   Let's start with diversity. I don't necessarily mean social identity diversity, which is what we typically think of. Not that it isn't important, but I'm talking about cognitive diversity--how people think, their training, their experience, their personalities. Scott Page [the author and University of Michigan professor] has shown that diverse groups are better at making predictions, for instance. Cognitive diversity--intentionally putting together different points of view that will challenge one another--is essential for hiring and for building teams. Even if you have a diverse team, if you're bowling everybody over with your point of view, that's not going to be of great value. Leaders have to step back and let those diverse views surface. This doesn't come naturally to executives. Often we try to hire smart people. We try to put smart people on teams. But we don't think enough about how much diversity can contribute. The key is to find smart people who think differently. **How do you go about this at Legg Mason?**   Our view basically is that a lot of the key day-to-day things people need to do to function are things we can train almost anybody to do. So that's not complicated. The complicated part is coming up with a high level of intellectual curiosity, with different skills and experiences. But we have to be mindful of it every day, because our natural inclination is to hang out with people who are mostly like us. **How can you manage information aggregation?**   Most managers, even executives, aren't naturally good at drawing out others' opinions. In fact, many organizations end up surrounding their executives with people who mostly want to please those executives rather than give them a frank assessment of what's going on. One solution is the "team of rivals" idea--the great executive who can surround himself or herself with people who will offer up different points of view, challenging the consensus within the organization. There has also been a burst of activity in the past 10 or 15 years around the notion of using prediction markets within organizations as a way of aggregating employees' knowledge--to make more-robust forecasts, for instance. Very few companies are harnessing this "wisdom of crowds" in any meaningful way. It could be an effective way of accessing the information in people's heads that they're not talking about. The key is to make sure that as a leader, you're not just tapping, you're actually almost extracting this unshared information from everybody and putting it on the table to be evaluated. And that's where a lot of organizations fail. **Short of setting up a prediction market, what's a practical way to do that?**   Frank Bryan, a political scientist, has done a lot of work on Vermont town hall meetings. Their moderators are taught to follow certain protocols to ensure that private information is shared. For instance, following Robert's Rules of Order, no one can speak twice till everyone who wants to has spoken once. That'd be a great rule to institute in every company. A simple rule like that would change a lot of dynamics very quickly in most places. **Anything else?**   Small experiments with controls are a terrific aid, and they're cheaper than ever. In his new book, Everything Is Obvious, Duncan Watts has a great line from Gary Loveman, of Harrah's Entertainment. There are only two ways to get fired at Harrah's: One is to steal from the company, and the other is to run an experiment without a control. That kind of approach allows Loveman to mimic nature. Harrah's is evolving through mutation and selection. And that's how you navigate when feedback is ambiguous or hard to come up with. Think about an investor in the stock market who buys stock that immediately goes up or down a little bit. Was buying the right decision? You don't know the answer for years. It's the same with decision making generally. **How do you think more broadly about strategy in a complex environment?**   There's an HBR article that I loved called "Strategy as Simple Rules" [January 2001]. The idea is that, especially in complex adaptive systems, a rapidly changing environment, we don't really know how things are going to unfold, so it's difficult to make forecasts or budgets going many years into the future. The authors, Kathleen Eisenhardt and Donald Sull, recommend creating a set of decision rules, somewhere between a half dozen and a dozen, that are virtually immutable: These are the things the organization stands for and that will guide your decisions. Then you pretty much let people decide on the fly in the field what they think makes sense given what they see. They're never to violate the basic rules, but they have a lot of flexibility to actually decide from moment to moment. I like that framework. I think that's a really valuable way to go. A company that has embodied that approach is Amazon.com. You don't necessarily know where they're going to go next, but they have very specific ways of thinking about their decisions. They're willing to kill things that don't work. And they're willing to investigate things that you might not think would be logical for them to do. But the strategy is simple. I think they're a good embodiment of that whole principle. **What are some rules of thumb for getting yourself into the right mind-set to deal with complexity?**   First, it's important to constantly learn and expose yourself to diverse points of view. But it's work to do that. I mean, there's a central joy in it, but it's work. It means you must allocate X% of your time. Typically the work is reading, but it's also speaking to people who are interesting and exposing yourself to realms that you're not familiar with.

## PolPros Mod-Link-Linear MPX Chain

**Infrastructure policy based on response to linear impacts blocks adaptability to complex systemic threats.**

**Ruth and Coelho 2006**

[Matthias Ruth is visiting professor at artec, Center for Sustainability, University of Bremen, Germany, Director of the Center for Integrative Environmental Research and co-director of Engineering and Public Policy at the University of Maryland

Dana Coelho is a graduate research assistant at the Center for Integrative Environmental Research

“Managing the Interrelations Among Urban Infrastructure, Population, and Institutions” Forschungszentrum Nachhaltigkeit (artec-paper Nr. 136)] Ruth Coelho 9

***3.2 Integrated Urban Assessment of Global Change Impacts***

Significantly younger than the LTER sites, and less formally connected, are a host of current urban assessment projects that were spawned by the recognition that global environmental change influences urban dynamics. The resulting impacts on cities and possible response options hitherto were neglected in research, policy, and investment decision making. These projects have paid special attention to the influences of climatic change on the adequacy and reliability of urban infrastructures, associated changes in urban environmental quality and quality of life. **In many instances, the underlying conceptual framework for analysis is some variant of the “drivers-pressure-state-impacts-response” (DPSIR)** approach proposed by the OECD (1993) and widely used by the European Environmental Agency (1998) and other institutions. In its basic form it distinguishes environmental, economic, and social components of the (urban) system, sometimes with a refined representation of individual infrastructure elements and their relationship to each other and to the overarching socioeconomic and environmental system as shown in the larger rectangle of Figure 2.

Integrated urban assessments, for each selected system element, describe its state, identify impacts on the respective element, and determine the responses of system elements to impacts. For example, water treatment infrastructure may be characterized by treatment capacities and capacity utilization. Impacts on those state variables may come from changes in population, economic activity, technology, or rainfall and runoff. Responses may be in the form of system failure, retrofits, upgrades, or changes in technology or demand elsewhere in the larger system. In many instances, changes in one element of the system (water treatment) may trigger changes elsewhere (e.g. energy supply for water treatment), thus creating ripple effects with often time-lagged, non-linear relationships to the original stimulus for change.

Indicators for element-specific and integrated (system-wide) impacts are quantified to inform investment and policy choices, which in turn feed back as new impacts to influence system states. To some extent, system changes are related (or, at least in principle, relatable) to the metabolism and overall macrobehaviors and emergent properties of the city. The latter are the subject of the next section of this paper.

Examples of more narrow assessments of global change impacts on cities – without explicit accounting for material and energy flows and without explicit efforts to provide a complex systems perspective to the emergent behaviors – are presented in Table 3. This table suggests that more recently, urban integrated assessments generally have become more ambitious with respect to the number of infrastructure systems and interactions they analyze, the diversity and roles of stakeholders in the respective projects, and the diversity and sophistication of methods and tools used to carry out the research. Still somewhat relegated to the sidelines are the actual social dynamics that accompany urban impacts and adaptations to climate change. This is largely true for the urban LTER projects discussed above.

Examples of larger-scale analyses that cover a mix of rural and urban areas and explicitly deal with underlying social issues include the work by Hollman et al. (2005a, b) for East Anglia and Northwest England. However, there, in part to be able to deal with a larger area and to include social dynamics, the resolution with respect to individual system components (infrastructures, economic sectors, etc.) remains relatively low, compared to the narrower, urban region-focused studies presented in Table 3.

Despite the advances in modeling and analysis of complex urban dynamics brought about by all of these studies, the field of integrated urban impact assessment is young and remains fairly disconnected from, for example, basic science approaches as illustrated in the urban LTER projects and similar efforts around the world. At the same time, insights from complexity theory have only implicitly guided the design of these studies and the interpretation of results.

## PolPros mod-AT Policy Relevance-1

**We are on the brink—Policy-makers are beginning to integrate complexity—Voting negative is a prerequisite to transportation planning that can adapt to unpredictable systemic change.**

**Dodder 2000**

[Rebecca Dodder, Technology and Policy Program at MIT “The Evolving Systems View of Transportation: Implication for Policy” <http://web.mit.edu/esd.83/www/notebook/Final%20Dodder.PDF>] Dodder 18

The Power of a Metaphor  Whether or not agent-based simulation modeling for transportation planning and management  becomes widespread practice, there are still ways in which Complexity could impact the future  evolution of transportation systems. While we have explored the models of Complexity, perhaps  more influential is the systems paradigm imparted by the metaphors that are used to describe  complex adaptive systems. Indeed, as noted by John Holland, one of the Santa Fe Institute’s  founders, models and metaphors provide many of the same functions. By abstracting from the  actual phenomena being observed, models and metaphors can reveal the underlying mechanisms  as well as the regularities and patterns in structure and behavior. Above all, they both “enable us  to see new connections” (Holland, 1998). The intuitive nature of many of the metaphors  employed to describe complex systems and their behavior implies that this complexity view of  systems might take hold in the policy community.  Understanding the dynamics  For the purposes of strategy in industry, David Levy notes that the complexity paradigm, by  rejecting the reliance upon “traditional reductionist framework” enables managers to understand  that industries are dynamic, non-linear systems. He points to several implications of complexity  theory for strategy (as quoted in Sussman, 2000b):  · Long-term planning is impossible  · Dramatic change can occur unexpectedly  · Complex systems exhibit patterns and short-term predictability  · Organizations can be tuned to be more innovative and adaptive  While Levy speaks to industry in this example, similar concepts are also valid in managing  transportation systems. Two of the lessons of complex adaptive systems, which could be most  useful to transportation decisionmakers and policymakers, relate to the ideas of 1)  counterintuitive systems behavior, and 2) policy resistant systems. While this might not  necessarily give policymakers a clear indication as to what types of specific policies would best  overcome these problems, an appreciation of the dynamics could enable policymakers to  recognize the potential for the unanticipated impacts of policies and lock-in to particular system  patterns.  Redefining the System  Clearly, transportation specialists have always had a keen appreciation of the complex  interrelationships between the physical transportation system and its socioeconomic components.  The transportation system have typically been seen an “embedded” in a broader socioeconomic  fabric, however, for the purposes of designing both systems and policies there has remained a  tendency to extract to the physical system as the object of design. There is agreement that the  individual decisions of drivers, which are simultaneously operators and users of the system,  impact both the current performance and the future development of that system. Yet, the  tendency to for analysis and modeling the networks and flow patterns has led many planning  activities to build in changes only on the technological system side, responding to the aggregate  preferences and decisions of people using the systems.  By using the metaphor of co-evolution in biological systems, one may be better able to  conceptualize the nature of the relationships between land-use, the environment, transportation  systems, and the socioeconomic system. Could a greater appreciation of the role of individual  agents lead to a greater acceptance of policies that focus on these demand-side issues (related to  the “activity system” in Manheim’s terminology), overcoming the problems identified by  Altshuler?  Measures entailing the direct regulation or consumer behavior or the  imposition of selective price increases to influence consumer behavior  have remained outside the realm of political acceptability….American  politicians are drawn inexorably to technical and service innovations as a  potential means of satisfying new public demands with minimal  disruption to existing social arrangements and behavior patterns  (Altshuler, 1981).  Similarly, could a conceptual expansion of the boundaries of the system foster organizational  change within government, to lead to a greater integration of policy planning for land use,  transportation and the environment?

## PolPros Mod-AT Policy Relevance-2

**Policy-makers already reckon with complexity in the transportation context**

**Dodder 2000**

[Rebecca Dodder, Technology and Policy Program at MIT “The Evolving Systems View of Transportation: Implication for Policy” <http://web.mit.edu/esd.83/www/notebook/Final%20Dodder.PDF>] Dodder 21

Complex Policymaking  I have outlined some trends in how the epistemic community of transportation systems may  begin to adopt many of the Complexity ideas and methodologies. Clearly a complexity view of  transportation systems would impact policies, but in what manner? Some policy analysts have  even begun to characterize the policy process using the concepts developed by complexity  theorists. In the updated version of his book, which explores the nature of policymaking,  Kingdon (1994) adds a new concluding chapter in which he identifies those facets of his model  of the policy process that share many of the properties illuminated by complexity theory.  First, they all find pattern and structure in very complicated, fluid and  seemingly unpredictable phenomena… the structures emerge from local  rules, rather than being imposed on high in some sense. Second, there is  a residual randomness left after one identifies as much structure as one  can, so that there is surprise and unpredictability…. Third, these models  are historically contingent (Kingdon, 1994).  Since the development of these epistemic communities is in itself an emergent phenomenon,  only history can judge the impact of complexity thinking on the field of transportation.     7   For example, the Central Flow Management Unit (CFMU) in Brussels is charged with the establishment and  regulation of schedules for all European air space, including strategic planning (on the order of months and years)  and tactical planning (on the order of hours) (Gras, 1999).  8  For further information, see MIT’s Center for Transportation Studies. “Trains and s and Cars, and People:  Human/Machine Interaction in Transportation.” Newsletter #41. web.mit.edu/cts/new/41/sheridan.htmlAn Emerging Transportation Systems Framework - Complexity 20  THE EVOLVING SYSTEMS VIEW OF TRANSPORTATION

## PolPros Mod-Wicked Problems

**How we frame the problem determines how we imagine the solution—Complexity is the only way to deal with “Wicked Problems” with many interlocking parts**

**Meierling 2010**

[Chris Urbina Meierling, College of Design at Arizona State University, “The Construction of Complexity in Design and Public Policy Contexts”

<http://www.drs2010.umontreal.ca/data/PDF/086.pdf>] Meierling 2

**Problem Complexity as Common Ground**Though little literature explores any sort of collaboration between the design fields and the policy development world, they are frequently paralleled in terms of problems and their solutions. Both areas of practice are involved in the development of knowledge surrounding social interactions, are significantly influenced by the social sciences, and are equally entrenched by the same root issues (Birkland, 2005; Schön, 1994; Owen, 2007). These root issues are best characterized by the ill-defined, wicked problems faced in planning activities (Rittel & Webber, 1969). Different from tractable problems involving measurement and direct relationships, many of the problems that designers and policy makers face are fraught with complexities outside our comprehension, leaving us only with tools, ranging from intuitive approaches to explicit strategies, as vehicles to apply our thinking to complex problems. For both designers and policy makers, complexity is a result of a confluence of multiple variables, the interplay between problem and solution, and diverse, irreconcilable stakeholders (Buchanan, 1992; Schön, 1994). **A Multiplicity of Variables**A multiplicity of variables is central to complexity for designers and policy makers. Subsequently, complexity arises from the level of facility we have in evaluating these variables and our ability to generate solutions sympathetic to those variables. In this case, complexity is often a question of how variables interrelate, coalesce and compound as part of a larger system (Weaver, 1948; Sarewitz, 2000). In fact, the development of systems theory is an indelible result of the identification and recognition of complexity as a phenomenon in our world. Warren Weaver, a founding thinker in complexity science, characterizes it as the predictability of outcomes of the variables within a system (Weaver, 1948). He juxtaposes disorganized complexity, with measurable properties and predictable outcomes, with organized complexity, "dealing simultaneously with a *sizable number of factors which are interrelated into an organic whole*" inherent to physiological, economic and political pursuits (Weaver, 1948). This same juxtaposition comes later from the more familiar language of Simon and Rittel in their conception of the ill-defined, wicked problems faced in planning activities. Different from the “tame” problems involving measurement, this type of problem is marked by unmanageable variables, conflicting stakeholder perspectives, interdependencies with other problems, and ultimate unsolvability. **The Interplay Between Problem and Solution**A second aspect of complexity comes from our inability to identify root causes and definite solutions to problems and the exchange between problem and solution. Many designers and policy makers might find that “the information needed to understand the problem depends on one’s idea for solving it” (Rittel & Webber, 1969, p. 225). That is, the process of identifying a problem yields a solution. Additionally, every wicked problem is an indicator of another wicked problem and solutions are coupled with other solutions (Rittel, 1970; Keeney, 1982). Given the difficulty of 'taming' these wicked problems and the plurality of problems and solutions, a problem has many unknown sources and a solution reveals other issues. This problem-solution quagmire and the aforementioned multiplicity of variables brings us to the limits of our cognition or our 'bounded rationality' leaving us only tools and strategies to cope (Farnham, 1990; Simon, 1969; Weiss, 1982). **Irreconcilable Stakeholders**While the multivariate, wicked nature of complexity indeed plagues much of decision making, additional difficulty arises out of the diversity of stakeholders that these decisions intend to represent. In this vein, complexity can quickly be traced to the social interactions between stakeholder groups surrounding an issue. Value trade-offs, multiple objectives and the absence of an overall expert among stakeholders are all characteristics of complex contexts (Keeney, 1982). When weighing the benefits of one decision over another and identifying what might be the most desirable outcome, the diverse, heterogeneous groups around issues can entrench our decision making contexts with competing values. Designers and policy makers diligently seek a "transcendent solution because…it is the only strategy which serves all of the values involved in a decision no matter whether they are assessed in terms of their intrinsic worth or in terms of the importance of interests behind them" (Farnham, 1990, p. 100). Therefore, complexity is inherently a social phenomenon and a result of the different perspectives and goals of actors in the decision landscape. Policy makers are aware of these unclear solutions and understand them through the interconnectivity of the many symptoms of wicked problems (Connors, 1996; Easton, 1965; Lloyd, 1978; Stone, 1988; Susser, 1992; Verduijn, & Brugge, 2001). The uncertainty that is described in policy development is also manifest in the design process through the designer’s inability to determine one definite, successful solution to a problem (Buchanan, 1992; Margolin, 1996; Owen, 2007; RED, 2006). Policy makers and designers share the same wickedness and deep uncertainty of their problems yet different approaches to cope with them have risen out of each area of practice. Similarly, both fields address these problems with a continuum of temporary solutions that only tame issues without resolving root problems. The insolvability of these root problems emerges as a point of departure for comparing complexity in design and policy development via the tools in each discipline.

## PolPros Mod-Wicked Problems

**Complexity is a prerequisite to infrastructure design adaptable to Wicked Problems**

**Meierling 2010**

[Chris Urbina Meierling, College of Design at Arizona State University, “The Construction of Complexity in Design and Public Policy Contexts”

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**Conclusion**

This paper tracks issues of complexity in design and public policy contexts and proposes that

differences in context, problem definition, value orientation, and participation are at the root of

the differing constructions of the same types of complexity. The research found that the

aforementioned variance in values is brought on by different management approaches of

stakeholders, styles of defining problems, and methods of accounting for variables. This leads

to different representations of complexity and ultimately different types of outcomes. It is clear

that the different cultures have produced different systems to handle complexity and vary in

the way they approach problems. Strategies such as collaboration, the development of

alternatives, iteration and participation assume different forms depending on the context in

which they are present. Tools also result in different outcomes, whether they are used in a

competitive, representative and reactive environment or an inclusive, participatory, and

proactive environment. Now more than ever, designers and policy makers are becoming

familiar with the complexities brought by our ill-structured, wicked problems. This research

serves as a foundational discussion by shaping a common language between design and

policy practice and is a starting point to begin sharing best practices and exploring

interdisciplinary collaboration.

# Cmplxty key to Policy… Topic

## Cmplxty key to Urban Infrastructure

**Integrating complexity is the only way urban infrastructure investment can adapt to multiple intersecting challenges**

**Ruth and Coelho 2006**

[Matthias Ruth is visiting professor at artec, Center for Sustainability, University of Bremen, Germany, Director of the Center for Integrative Environmental Research and co-director of Engineering and Public Policy at the University of Maryland

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“Managing the Interrelations Among Urban Infrastructure, Population, and Institutions” Forschungszentrum Nachhaltigkeit (artec-paper Nr. 136)] Ruth Coelho 3

In addition to purely demographic changes are a suite of environmental conditions that are influencing and being affected by urbanization. Most cities are located in, and are growing primarily in coastal zones, in part because of the importance of access to natural resources and transportation networks in an increasingly globalizing world. Population densities in coastal areas are approximately 45 percent greater than global average densities (McGranahan and Marcotullio 2006). For example, 32 percent of Sri Lanka’s total population resides in coastal zones, 65 percent of the urban population, 90 percent of industrial units, and 80 percent of all tourist infrastructure (UNEP 2001c). Clearly stated in the Millennium Ecosystem Assessment report: “As people are increasingly living in cities, and as cities act as both human ecosystem habitats and drivers of ecosystem change, it will become increasingly important to foster urban systems that contribute to human well-being and reduce ecosystem service burdens at all scales” (McGranahan and Marcotullio, p797).  ***2.2 Urban Infrastructures and Institutions***  Adequate supply of infrastructure systems and services, such as water, sanitation, power, communication, and transportation, allows cities to grow and prosper. In some regions, particularly in Africa and Asia, very basic deficiencies characterize urban systems of all sizes. According to some estimates, as much as 50 percent of the urban population in Africa and Asia may be living without “adequate”  7  provision of water and sanitary services. In many of these areas single points of service (i.e. water pumps or latrines) are shared by dozens or hundreds of individuals, significantly limiting sufficient access and safety. Similarly, solid waste disposal, wastewater treatment and transportation networks are frequently insufficient and poorly maintained (see, e.g. UNEP 2001b, c).  However, the challenges of inadequate or declining infrastructures are not confined to the developing world. In some developed nations, particularly Australia, public spending on infrastructure has decreased over the last few decades. Private investment in the provision of electricity and water has increased, but distribution suffers from decentralized services, and concerns abound over the ability of profit-seeking firms to equitably provide public services such as water and transportation (Newton 2001). This concern is pervasive not only in Australia, but in other nations as well (WDR 2006). In the U.S., infrastructure systems have regularly received “poor” or “failing” grades in report cards issued by the American Society of Civil Engineers (ASCE 2005). ASCE evaluates infrastructure systems based on condition and performance, as well as capacity and funding with respect to need. Based on their analysis, there has been little to no improvement since 1998, and there are some $1.6 trillion in recommended infrastructure improvements over a five-year period.  It is the role of institutions, such as government and planning agencies, markets and non-government organizations to anticipate and assess the adequacy of existing infrastructure and the desirability of new infrastructure, to facilitate decision making, and to oversee implementation, operation, maintenance and  decommissioning of infrastructure systems. This is particularly crucial in cities, given the close spatial and functional relationships among the various social, economic and environmental processes. Challenges in fulfilling that mission often are related to inabilities to secure adequate funds, inequitable access, the lumpiness and irreversibility of infrastructure investments, and the roles of risk, uncertainty and surprise in investment decision making. Each challenge is discussed briefly here, before we proceed to turn to the ramifications of urbanization for material and energy use, environmental quality, and quality of life.  **2.2.1 Infrastructure Investment**   Typically, large-scale infrastructure investments are undertaken by government to provide public goods. Examples include the building of dams, wastewater collection and treatment systems, energy supply systems, ports, and roads. However, investment by private enterprises in infrastructure systems should not be overlooked. Notable examples include investments in communication and data storage capacity that made possible the explosion in information exchange and internet commerce. While public investments are typically funded with long-term bonds or loans and with the goal of providing public goods, private infrastructure investments are usually made with much shorter time periods in mind, and with greater attention towards pay-off to the investing parties.  Increasingly, public-private partnerships are used to leverage access to capital with clear profitability goals in mind, while at the same time creating synergistic effects among infrastructure investments, regional competitiveness,  9  and larger-scale socioeconomic development. For example, funding for transportation networks or wastewater treatment may come in part from private enterprises who may, in return, receive revenues from user fees. Private investment in electricity and telecommunications infrastructure in Latin America has increased access to services; however overall public investment in infrastructure fell from three percent of GDP in 1980 to less than one percent in 2001 (WDR 2006). Local authorities may help support the development of eco-industrial parks so that a range of diverse businesses can allocate in close proximity to one another in order to close material cycles, reduce cost of material inputs and minimize effluents while at the same time offering centralized employment opportunities and improved environmental quality. The reduction in investment risk is spread across different parties, allowing for longer planning horizons than would be chosen by private enterprises under normal circumstances.  However, under any model – purely public, purely private, or public–private partnerships – few provisions are typically made to deal with the cost associated with decommissioning infrastructure at the end of its useful lifetime or the cost of retrofitting after expiration of bonds or loans. As a result, the time-delayed burden to deal with the legacy of obsolete infrastructure is often placed on future generations, which considerably contributes to the complexity of urban dynamics and adds challenges to future decision making.

## Cmplxty key policy research on land use evaluation

**Complexity is a prerequisite to effective land use policy**

**Manson 200**7

[Steven M Manson: Department of Geography, University of Minnesota, “Challenges in evaluating models of geographic complexity” Environment and Planning B: Planning and Design 2007, volume 34, pages 245 ^ 260] Manson 1

Abstract. Geographic complexity, the explicit integration of complexity research with space and place-based researchöfaces interrelated methodological, conceptual, and policy challenges. The rubric of model evaluation is central both to understanding and to meeting these challenges. They include methodological issues such as sensitivity and complex scaling; the conceptual challenges of conflating pattern and process, and reconciling simplicity and complexity; and policy issues posed by the science ^ policy gap and postnormal science. The importance of these challenges and the centrality of model evaluation in meeting them are demonstrated through examples drawn from human-environ- ment systems, with particular reference to global environmental change and land-use and land-cover change. Specific model-evaluation strategies are also offered.  Modeling geographic complexity 1 Introduction Complexity theory is leading many disciplines in consideration of the importance of geographic(1) concepts, and researchers of place and space increasingly use complexity theory (O'Sullivan, 2004; Thrift, 1999). This integration is especially notable in geographic information science (GISc), an early adopter of complexity approaches, such as agent- based modeling and cellular automata. Despite good prospects for continued growth, geographic complexity faces intertwined methodological, conceptual, and policy challenges that remain to be addressed in a comprehensive manner. Model evaluationöcalibration, verification, and validationöprovides a useful, and perhaps necessary, rubric with which to examine these challenges and to develop strategies that meet them. In section 2, I define geographic complexity and explore how its epistemological underpinnings point to the primacy of modeling and model evaluation in understanding systems of geographic complexity. In section 3, I consider methodological issues raised by sensitivity and scale in complex systems, and in section 4, I examine conceptual challenges posed by questionable conflation of process and pattern, and the tension between sim- plicity and complexity in complex systems. In section 5, I consider policy challenges posed by the science ^ policy gap and the related notion of postnormal science. Each of these sections ends with potential solutions to the challenges raised by these methodological, conceptual, and policy issues. Throughout I also note critical connections between these challenges and draw on examples of coupled human-environment phenomena, particularly global environmental change and land-use and land-cover change.

## Complexity key to pol-making

**Complexity is a prerequisite to effective policy-making**

**Johnson 2010** (Liz, Ph.D. Candidate Public Policy Program The University of North Carolina at Charlotte papers.ssrn.com/sol3/papers.cfm?abstract\_id=1657193)

The challenges facing the design and implementation of science and technology policy can be analyzed in various contextual frameworks, but need to account for innovation as a complex adaptive system. Furthermore, in hard times, it is even more imperative to reevaluate how we conceptualize innovation to ensure we do not fall victim to the myth of isolated systems. The central purpose of this paper is to explicate science and technology innovation as a complex adaptive system and explore the properties and mechanisms that can be directly applied to the policy process. Since form follows function, and function continually reforms form, how can these principles be best applied to innovation as a complex adaptive system, and what form should policy take? Also, what is the form and function of technology and invention as interrelating components of innovation? Ideally, policymaking strategies need to move dramatically beyond practices of fractionalizing systems of the innovation whole, and reinforce the natural processes of complexity. Effective policy should encourage co-evolution in which systems learn and adapt to a constantly changing environment, in addition to increasing resilience to absorb shocks from random events and unexpected consequences of action. An understanding of system changes and new states of innovation will be evaluated in terms of proactive and reactive policymaking strategies with the goal of strengthening and sustaining the whole. Theoretical building blocks of system pace, action dynamics, and simplicity will also be considered for further policy application. Though the discipline of complexity is still in its early stages, it has enabled successful application and breakthroughs in fields like biology, economics, and consciousness. Studying innovation as a complex adaptive system can serve as a foundational tool in policy studies to expand our epistemological and ontological perspectives to build theory accounting for complexity, whether hard times or not.

**Form comes before function—Complexity provides the frame necessary for effective policy-making**

**Johnson 2010** (Liz, Ph.D. Candidate Public Policy Program The University of North Carolina at Charlotte papers.ssrn.com/sol3/papers.cfm?abstract\_id=1657193)

As we face challenging times and move further into the rapid evolution of transformative, emergent, and convergent technologies, it is critical to examine what would be effective innovation policy and what *form* it could and should take. Does the unique nature of innovation as a complex adaptive system (CAS) operating in a global economic network thrive more under an incremental policy *form* or should we adapt for an interrelating systems approach to policy? Furthermore, given the challenges in science and technology policy, can the *form* of policy be expanded “in order to improve or made more fit for a particular purpose,” (TheFreeDictionary.com, 2009) like national innovation success? Times of global economic challenges do not preclude deviceful thinking and focused attention on national innovation as a complex adaptive system, with unique demands and application for policymaking.

Also critical to consider is the generally accepted principle that *form* follows *function* (Brand, 1994). The *function* or use of the design of innovation policy is to spur and trigger economic growth. The *form* of the policy should take into account how to most effectively organize and direct the coordinating parts of an innovation system for successful outcomes measured in patents, increased entrepreneurship, commercialization, and economic growth. However, “*Function* reforms *form*, perpetually” (Brand, 3). Further to consider is what are compelling strategies to design better policy in a globally competitive environment where many complex factors are out of policymakers’ control? *The Science of Strategy* views all competitive situations in terms of *position, conditions, decisions*, and *action*. In relation to innovation, *position* is how an entity, such as country, ranks in relation to other countries. The *condition* to examine is United States innovation as a complex adaptive system nested2 in a globally, competitive economic system. Yet no matter what the competitive challenges and level of complexity, the goal is to improve position or outcomes of innovation (Science of Strategy, 2009). To improve national innovation positions requires making the right decisions and actions in the form of appropriate policy design and ensuring its implementation. Given that innovation *functions* as a complex adaptive system, it is important to understand its mechanisms, potential to evolve, and unique systems of technology innovation. I will assess the *form* and *function* of technology and innovation in a policy context, as a complex adaptive system. Additional academic attention should also be given to a viable policy *form* that can best actualize the *function* of national innovation policy systems. Finally, I will assess policy *forms* and explore how they can be customized and disposed to better fit the demands and strategies necessary for successful innovation policy.

# Cmplxty key to Risk Communication

**Your ballot should interrupt the 1AC’s communication of risk.**

**Their reductionist framework backfires, undermining political responsibility in the face of threat.**

William J. **Kinsella**, Assoc Prof Communication at NC State University, **2010**

[“Risk communication, phenomenology, and the limits of representation” *Catalan Journal of Communication & Cultural Studies* 2 (2) pp. 267–276]

Despite movements towards more dialogic and rhetorical models, the field  of risk communication remains rooted in a number of its foundational com-  mitments. Objectivist ontologies and epistemologies assume that risks are  constituted prior to their confrontation by human subjects. Such objective risks  are, in principle, fully amenable to accurate descriptions that can be tested  conclusively against reality. Descriptions that pass such tests should be  acceptable to all rational parties, providing a touchstone for consensus.  One-directional ‘transmission’ or ‘information’ models of communication,  derived from engineering traditions, assume that once such risks are properly  described the communicative task is to share those descriptions accurately,  without ‘distortion’, ‘noise’, ‘amplification’, or ‘attenuation’. In this vision of  risk communication, risk is the primary phenomenon and communication is a  secondary and subordinate process. The task of describing (‘assessing’ or ‘ana-  lysing’) risks is typically assigned to an authoritative community of ‘experts’,  who transfer their superior knowledge to a (typically monolithic) community  of non-experts. This constellation of premises regarding ontology, epistemol-  ogy, authority and practice constitutes a powerful but particular discourse of  risk: what can and cannot be said, who can speak and in what settings and  circumstances, what makes sense and does not make sense, what are rational  and irrational ‘perceptions’, what can and cannot be done, and what should  and should not be done about risk.  Risk discourse has become more reflexive and self-critical during the past  few decades, and as the multiple ironic quotes in the previous paragraph sug-  gest, there is no shortage of critiques of the foundational premises described  above. Few proponents of naïve objectivist epistemologies remain in the philo-  sophical community or elsewhere. Instructors in the field of communication rou-  tinely dismiss transmission models during the first week of class, although the  need to do so never seems to disappear, over time or across levels of instruction.  Critics have thoroughly challenged ‘deficit’ models of public understanding of  risk (Gross 1994; Sturgis and Allum 2004; Wynne 1992, 1996), which Katz and  Miller (1996) have characterized as ‘contemptuous’ in their dismissal of pub-  lic capacities. Case studies have repeatedly demonstrated how the constella-  tion of premises described above privileges and promotes institutional interests  over broad public interests (Gwin 1990; Kinsella 2001, 2007; Sauer 2003; Young  and Matthews 2007). Beyond the specific field of risk communication, theories  of public discourse have increasingly rejected models of a monolithic ‘public’,  recognizing the existence of multiple ‘publics’ and ‘counterpublics’ with their  own ways of knowing and forms of expertise (Asen and Brouwer 2001; Warner  2002).  Despite these critiques, there is plenty of evidence that the foundational  premises live on in the everyday practice of risk communication and in much  risk communication theory. Those premises are deeply entrenched, repeated  and reinforced (at least implicitly) in countless formal and informal statements  about risk, and thoroughly institutionalized in the fields of risk assessment,  risk regulation and risk communication. One reason for their persistence may  be that, although much convincing critical work has been done, few coherent  frameworks have been offered as alternatives to the received view. Attempts  to create such frameworks typically fall into the trap of building with the avail-  able materials: the ontological and epistemological presumptions that are the  foundations of modern thought.  HEIDEGGER’S PHENOMENOLOGY AS A FOUNDATION FOR RISK  COMMUNICATION  This essay builds upon one set of resources that might provide a different  foundation for risk communication. In a body of work spanning his so-called  ‘early’ and ‘late’ writings, Martin Heidegger developed a radical critique of  prevailing ontology, epistemology and metaphysics. Although many commen-  tators regard Heidegger’s earlier and later writings as substantially different  in their focus and their implications, they also exhibit important continuities.  In his earlier work, most famously in Being and Time, Heidegger argued that  beginning with the later Greek thinkers, philosophy lost track of the most cru-  cial ontological question, which he called the ‘question of being’. This forget-  ting (as Heidegger called it) of the question of being led to an estrangement of  humans from the other entities that populate the world, from other humans  (regarded only as other entities and in the same terms), and ultimately, from  the essence of humanity itself.  In later work, most famously in his essays (based on earlier lectures) The  Age of the World Picture and The Question Concerning Technology, Heidegger  more closely examined the phenomena of modern science and technology,  which he regarded as distinctive and essential attributes of the contempo-  rary age. This later work develops the much-cited argument that ‘the essence  of technology is by no means anything technological’ (Heidegger 1977a: 4)  but rather, consists of the ‘enframing’ of the world as a ‘standing reserve’  of resources for human use. The opening paragraph of The Age of the World  Picture demonstrates how this later line of work connects to the general cri-  tique of metaphysics provided in his earlier writings:  In metaphysics reflection takes place regarding the essence of what is  and a decision takes place regarding the essence of truth. Metaphysics  grounds an age, in that through a specific interpretation of what is and  through a specific comprehension of truth it gives to that age the basis  on which it is essentially formed. This basis holds complete dominion  over all the phenomena that distinguish that age.  (Heidegger 1977a: 115)  If risk is a key phenomenon that distinguishes the present age, as Beck (1992)  and others have argued, then a critical metaphysical analysis may provide a  foundation for a more productive discourse of risk. Such an analysis can illu-  minate how specific interpretations and specific concepts of truth dominate  the discourses and practices associated with risk (as a general principle) and  risks (specific objects regarded as manifesting that principle).  Heidegger’s concept of the historically-specific ‘world picture’ in some  ways anticipates Foucault’s concepts of ‘epistemes’ and ‘regimes of truth’.  Heidegger does not argue that a ‘modern world picture’ has replaced dif-  ferent world pictures characterizing earlier ages. Instead, he argues that  the very principle that the world can be, and necessarily is, grasped as a  ‘picture’ – that is, the principle of representation – is ‘what distinguishes  the essence of the modern age’ (Heidegger 1977a: 130). Ideally, such rep-  resentation is accurate, and for Heidegger, it is always total. In the age of  the world picture, what cannot be represented or is not represented does  not exist. Furthermore, as the agents of representation, human beings  become the authors of the world. Here Heidegger’s critique of metaphysics  intersects with his related critique of humanism (Heidegger 1977b), under-  stood as the distinctively solipsistic modern condition in which humans  place themselves at the centre of a world picture they themselves have  authored.  Heidegger’s work has influenced a vast body of subsequent social theory.  A thorough discussion of post-Heideggerian perspectives relevant to the  field of risk communication would require a book-length project (or multiple  projects) examining, at least, the following themes:  The work of the Frankfurt school, which linked concepts from Heidegger •  with concepts from other key thinkers to critique the constraining effects  of the twentieth-century formation of culture, politics, society and institu-  tions, and its successor project, critical theory;  Foucauldian perspectives, which like Heidegger’s, emphasize the crucial •  role of language in producing meaning and power;  The autopoietic systems approach of Luhmann (1989, 1990, 1993), •  grounded in part in phenomenology, in which communication constitutes  a set of field-specific ontologies associated with society’s ‘functional sub-  systems’;  Communication theories such as those of Deetz (1973, 1992) and Stewart •  (1972, 1986, 1995, 1996), which draw directly on Heidegger’s phenom-  enology to argue that language constitutes, rather than merely describes,  the world;  Theories of environmental discourse and environmental ethics (e.g. •  Zimmerman 1983, 1994, 2003) that apply concepts from Heidegger to  question anthropocentric views of the human-environment relationship;  The critique of computational intelligence offered by Dreyfus and his •  collaborators (Dreyfus 1992; Dreyfus and Dreyfus 1986), which draws  on Heidegger to challenge prevailing approaches to modelling complex  systems;  Heideggerian-influenced theories of the politics of scientific knowledge as •  exemplified by the work of Rouse (1987, 1991, 1993, 1996).  None of these perspectives, including Luhmann’s work, which examines  the topic of risk explicitly and closely, has yet been adequately embraced  by the risk analysis and risk communication communities.1 Addressing this  gap, the remainder of this essay sketches a framework for extending key  ideas from Heidegger, especially the argument from The Age of the World  Picture, to the field of risk communication. Rather than attempting to  draw upon all of the perspectives cited above, the essay emphasizes two  of them: constitutive communication theories and Luhmann’s autopoietic  systems approach.  ENTANGLEMENTS OF ‘RISK’ AND ‘COMMUNICATION’  Heidegger’s critique of modern metaphysics in Being and Time takes the form  of a phenomenological analysis that he describes as a project of ‘fundamen-  tal ontology’ (Heidegger 1962: 34). Broadly described (in terms not fully con-  sistent with Heidegger’s neologistic vocabulary), his analysis examines the  relationship between the knower and the known, the subject and the object.  Applied to the problematic of risk communication, such an approach presum-  ably would entail a phenomenology of risk and a phenomenology of com-  munication. But as such an analysis proceeds, it quickly becomes evident that  ‘risk’ and ‘communication’ are deeply entangled phenomena. Risk can be  variously viewed as an object, topic or referent of communication; a prod-  uct or outcome constituted by communication; and an inevitable, existential  dimension of communication.  Risk as an object/topic/referent of communication  The object/topic/referent view of risk is the most ‘natural’ or ‘common sense’  view: risk is out there in the world, an exigence calling for communication.  In his classic essay on ‘the rhetorical situation’, Bitzer (1968: 6) cited one  modern risk, air pollution, as an example of a rhetorical exigence, ‘an imper-  fection marked by urgency; it is a defect, an obstacle, something waiting to  be done, a thing which is other than it should be’. For Bitzer (1968: 7), such  an exigence ‘strongly invites the assistance of discourse producing public  awareness, indignation and action of the right kind’. However, he cautioned  his readers not to ‘assume that a rhetorical address gives existence to the  situation; on the contrary, it is the situation that calls the discourse into exist-  ence’ (Bitzer 1968: 2). Similarly, Beck’s sociology of risk views exigences such  as air pollution as ‘reflexive’ in the sense that they are products of human  activity demanding human attention, but nevertheless, as external phenom-  ena to be recognized, characterized and remediated using the tools of sci-  ence and technology.  Risk as a product/outcome constituted through communication  Phenomenologically-grounded communication scholarship has long prob-  lematized such realist ontologies and the representational view of language  they entail. This body of work argues that communication does not represent  an existing state of affairs, but rather, constitutes a state of affairs. Stewart  (1972, 1986, 1995, 1996) argues against ‘two worlds’ or ‘semiotic’ or ‘symbol’  models of communication, which assume the existence of an external world  of entities and facts and a parallel world of linguistic description. Deetz (1973)  has argued that most models of communication have taken ‘derivative’ views  of language, presuming that words refer to things (the ‘referential’ view),  stand for concepts (the ‘ideational’ view) or elicit behavioural responses (the  ‘behavioural’ view). He argues that such ‘formalistic, nominalistic, derivative  conceptions of language seem to be designed for a technological society intent  on controlling the environment and mankind and for transmitting facts rather  than generating insight’ (Deetz 1973: 51).  Later work by Deetz (1992) focuses on the politics of discourse in organi-  zational and institutional settings. As risk is largely defined, managed and  negotiated in such settings, and because of its direct focus on communication,  this work has particular (but as yet unexamined) relevance for the field of risk  communication. Representation is a key term in Deetz’s analysis, appearing in  two senses. First, a politics of representation, understood in the sense of dem-  ocratic political theory, constitutes a world of actors deemed to be legitimate  stakeholders in respect to particular problems, programmes, policies, issues,  actions, decisions and the like. Democratic principles require that the interests  of these stakeholders be appropriately represented in discourse. But at a sec-  ond and more fundamental level, representations of the world, accomplished  through language, constitute the very possibilities for such democratic relation-  ships. In representing the world through language, humans do not describe a  pre-existing world, but rather, constitute a world of objects and relationships.  Following a rather different and highly distinctive approach, Luhmann also  identifies communication as the fundamental organizing principle for society.  For Luhmann (1989, 1992, 1995), communication provides the observations  and distinctions that constitute a world of objects and their characteristics.  This part of his analysis follows Heideggerian principles, but he also incor-  porates insights from self-organizing systems theory and a profoundly binary  view of the observations and distinctions accomplished through communica-  tion. Luhmann (1989, 1995) identifies six ‘functional social subsystems’, each  characterized by a unique, binary communicative code: economy, law, science,  politics, religion and education. Economic distinctions follow the code of ‘prof-  itable/not profitable’, legal distinctions the code of ‘legal/not legal’, scientific  distinctions the code of ‘true/not true’, and so forth. These subsystems are  largely insulated from each other, each treating the others as part of its own  environment, but interact with varying degrees of ‘resonance’ when their envi-  ronmental conditions demand attention. He has applied this model directly to  the topic of risk (Luhmann 1990, 1993) and the closely related topics of ‘eco-  logical communication’ (Luhmann 1989), trust and power (Luhmann 1979).  In his essay on ecological communication Luhmann (1989: 1, 23) remarks  that society has ‘become alarmed as never before’ as ‘the system registers the  effects of its own behaviour upon the environment’. He argues, however, that  when environmental concerns are articulated through the specialized lan-  guages of society’s subsystems, ‘system rationality increasingly loses its claim  to be world-rationality’ (Luhmann 1989: 138). He characterizes this condi-  tion as one of, simultaneously, ‘too little and too much resonance’ (Luhmann  1989: 115ff.). Too little resonance exists when specialized codes restrict soci-  ety’s capacity for ‘noticing and processing environmental changes’. In such  cases ‘social communication is alarmed and stimulated to more activity [...]  without being able to translate this requirement into the language of the func-  tion systems’ (Luhmann 1989: 116). Too much resonance exists when, for  example, ‘the economy is at the mercy of scientific discoveries and techno-  logical innovations as soon as these find economic use’, irrespective of their  environmental consequences (Luhmann 1989: 117).  Luhmann’s perspective has been criticized for its abstractness and inflex-  ibility in reducing all communication to a set of binary codes (Habermas 1987;  Leydesdorff 2000; Mathur 2005; Miller 1994). Beck (1995: 77, 113) character-  izes Luhmann’s view as one of ‘industrial fatalism’, in which the limits of  system codes and the fragmentation of system logics disable the possibili-  ties for individual and social action. Nevertheless, it is possible to reject the  totalizing view of systems logic presented by Luhmann while recognizing the  degree to which such logic prevails in contemporary society. Regarded this  way, Luhmann’s view can be a tool for critical and cautionary analysis of com-  munication in general and risk communication in particular. His critique of  ‘system rationality’ that ‘loses its claim to be world rationality’ is consistent  with Heidegger’s view of the world picture, but offers a more detailed analy-  sis that might serve as a foundation for transcending the limits of society’s  dominant logic or at least for integrating society’s functional subsystems more  productively.  Risk as an existential dimension of communication  A third way to regard risk, and a view consistent with Heidegger’s phenomenol-  ogy, is to recognize its inevitability and the existential challenge it poses. The  modern world picture enframes risk as an external phenomenon amenable to  calculation and control, either as a threat to be minimized or a standing reserve  of opportunities to be exploited. Risk takers evaluate and act upon risk objects,  but are fundamentally alienated from those objects. Constitutive views of  communication can highlight, alternatively, how in ‘assessing’, ‘evaluating’,  ‘managing’, or ‘regulating’ risks, humans constitute not only those risks, but also  themselves and their fellow humans in relationship to risk and to each other.  Such acts are suffused with politics and power relations, enframing and objectify-  ing not only risks, but also individuals, groups, communities and the non-human  world.

Following Heidegger, this view regards risk as an existential challenge  and a call to responsibility, and human responses as constitutive of individual  selves, communities, organizations, institutions, societies and cultures.  In this regard, Luhmann (1990: 225) suggests that risk is not the opposite  of security, as typically understood. Instead, he distinguishes between risk and  danger, where risk comprises phenomena ‘attributed to a human decision’ and  danger comprises phenomena ‘attributed to external events’. For Luhmann,  risk only comes into play when we make conscious or deliberate decisions;  that is, when we attempt to control envisioned outcomes. Viewed this way  risk is paradoxical: the more we seek to control our world, the more risk, and  responsibility, we assume.2  CONCLUSION: REPRESENTATION, RISK AND REFLEXIVITY  Luhmann notes that observations always involve ‘twin risks’ associated with  two levels of distinction. To characterize an event as ‘likely’ or ‘not likely’  obviously involves the risk of error. But a second risk accompanies the very  selection of the event to be evaluated, a choice that may or may not prove to  be pertinent or relevant. As Luhmann (1993: 74) puts it, ‘everything depends  on the sort of distinction: sea battle and not land battle; sea battle and not sea  trade’. Focusing on one set of risks entails disregarding others. In attending to  economic hazards and opportunities, we risk ignoring the ecological implica-  tions of our economic choices; in evaluating national security hazards we risk  losing sight of hazards to personal freedom. Society has developed a range  of subsystems corresponding to these various risk categories, but the catego-  ries are in fact products of those subsystems, constituted through the codes of  those subsystems. The limits of those codes and the assemblage of those sub-  systems remain problematic. Conditions of insufficient or excessive resonance  across subsystems are only part of the problem; the larger question deals with  what phenomena we select for attention and how we allocate our attention  across those phenomena. Reflexively, these choices constitute not only risks,  but also those who take and bear risks.

## Cmplxty key to Risk Communication-2

**Accepting the unpredictability of complex systems is a prerequisite to political communication—The Affirmative’s circulation of crisis and fear destroys our ability to formulate action in the face of threat**

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[Professor of geography and environmental science at Saint Mary’s University “Complexity, Science and the Public : The Geography of a New Interpretation” *Theory, Culture & Society* Vol. 22(5): 113–140] h

Learning about Expectations

 How does complexity affect people’s expectations concerning their interaction with the world?  It teaches them to include in their worldview ﬂuctuations, perceived  as ‘events’. Whether we talk about ﬁnancial crises (Sornette, 2002) or about  ﬂoods (Turcotte, 1993), ﬂuctuations are always there. Fluctuations are part  of the system dynamics, and they represent the rule, rather than the exception, in real complex systems (Prigogine, 1980). Complexity also teaches us  that large ﬂuctuations – seen as ample events, and sometimes as catastrophes – are not necessarily triggered from outside of the system, in exceptional ways, but are often created by the same category of mechanisms  involved in small-scale changes: the distribution pattern of the size of events  comprises virtually all sizes, with the frequency of events increasing as the  size of the events decreases (Bak, 1996).  Are people aware of this characteristic of event patterns? Not necessarily. In fact, risk perception is the result of a multitude of interrelated  processes, cultural factors being particularly important (Wildavsky and  Dake, 1990). The lesson of complexity supports the ‘discovery’ of certain  event patterns and the realization of the fact that sizeable events will always  occur: they are embedded in the functioning rule of complex dynamic  systems. The latter usually include many interacting subsystems able to  produce avalanche-like phenomena, amplifying certain processes to various  degrees, depending on circumstances which are permanently changing. The  dynamic behaviour of a system depends on the number of interacting  subsystems, the type and strength of interactions, etc. (Suteanu et al., 1997).  What does this mean for the social perception of hazards, for instance?  First, that one is unavoidably exposed to a variety of events, including largesize events: there is actually no justiﬁcation for hopes that the latter will  cease to occur. Second, that in this regard, one should not expect ‘the’  solution from technology. Why this sudden lack of faith in all-powerful technology? Because complexity shows that event patterns are not restricted to  ‘natural’ phenomena.

Such event patterns are characteristic of both natural and technological processes. Internet access dynamics, for example, are characterized by  such ﬂuctuation patterns (Adamic et al., 2001). In fact, many types of  network structures, from the world wide web to networks of actors who have  been involved in the same ﬁlms, emphasize self-similarity, that is, similar  aspects at many levels (Song et al., 2005). Self-similar patterns have been  found also in the case of human friendship networks, in networks of scientiﬁc collaborations and in the airline links between airports (Strogatz, 2005).  Many types of event sizes also reﬂect this property: small, medium and large  events are related to each other by means of one and the same type of  relationship, mathematically described by a power-law. Self-similar event  size distributions, which include events of ‘all sizes’ – with a frequency that  decreases with increasing event size – are indeed typical of natural phenomena (such as earthquakes or landslides, for example), but have been found  in many other situations. They also characterize, for example, patterns of  technological accidents, such as oil spills (Englehardt, 2002). Acid deposition events emphasize a self-similar pattern too (Zhu and Liu, 2003).  Power outages belong to the same pattern category (Robinson, 2003). International relations have been analysed from the point of view of interacting  dynamic systems (Grossmann and Mayer-Kress, 1989): wars have also been  found to correspond to this type of self-similar event size pattern (Cederman,  2003).  These results have direct implications for the nature–non-nature  dichotomy, and – most importantly – they generate premises for a new kind  of landscape: will the emerging geography have to include a general feeling  of vulnerability? If big events, whether good or bad, have to happen, should  we at least expect scientists to predict them?

Learning about Prediction and Control

It is precisely the advancement in complexity, both in its conceptual framework and in its methodology, which provides powerful tools to cope with the  ‘wild’ dynamics of complex systems (Sornette, 2000). And yet, here lies also  the source of insights concerning limits in our capability to make predictions. The lesson of the Lyapunov exponent mentioned above (in the subsection, ‘“To Be Reproducible”: Admitting Uniqueness’) means that  complex dynamic systems may pose information-related obstacles to interaction with them. Sensitive dependence on initial conditions and perturbations affects one’s capacity to predict their behaviour.  The degree of predictability does not depend exclusively on technological limits, which means that it does not change to suit the rhythm of  technological progress: in the case of chaotic systems, we have to multiply  our technological effort many times over to reach only moderately enhanced  results, and these enhancements weaken fast when we go further in time.  This is not to say that signiﬁcant progress with respect to dynamic system  prediction has not been made or will not be made in the future, nor does it  suggest that there are limits to achievable progress. However, this problem  points to profound sources of constraints regarding predictability.  For the public, an inevitable implication is that science really has a  problem: it will never be able to predict accurately the dynamic behaviour  of chaotic systems. In fact, instead of an expected breakthrough in this domain, science has provided proof that its ‘failure’ has solid foundations.  The feeling of vulnerability can only be enhanced thereby.  If prediction is such a challenging problem, what can be expected in  terms of control? The answer here is not quite so negative. Based on principles of complexity, the resourcefulness of scholars has led to methods of  what is called ‘chaos control’ (Ott et al., 1990). The idea is that if the system  is unstable, and you know when, where and how to act upon it, you can  guide or control it, using very little energy to do so. Instead of a large amount  of energy, you need information. Spectacular technological applications  have already begun to emerge (Boccaletti et al., 2000).  What does this imply for the public worldview? Does this mean that  any complex system could be, in principle, subject to control? Studies of  systems with many degrees of freedom show that control is hindered by  fundamental factors: while knowledge about the details of system conﬁguration is essential, these details change constantly as a consequence of  system functioning; in other words, an action prepared for a certain situation can (and does) meet new conﬁgurations, which can lead the system  along another evolutionary scenario than the one envisaged (Suteanu, 1999;  Suteanu et al., 1997). Despite such obstacles, the future remains open to  new and possibly unforeseen progress in this direction. If scholars are  enthusiastic about these possibilities, such prospects are not necessarily  reassuring for the public, who would unavoidably envision new sources of  manipulation.  However, even in absence of an explicit goal related to the control of  others, uncertainties about the future of the nature of freedom in a system  made of many interrelated and strongly coupled subsystems, sometimes  emerge. In a book that does not enjoy the dissemination it deserves, Florin  Munteanu (1999) explains how mechanisms of fear-induction and escalation in social systems are related to concepts of complexity, starting with  scale-transcending feedback processes. ‘What is the chance of human  freedom in a world of high complexity?’, ‘What is the degree of individual  responsibility in a complex world of collective effects with high nonlinearity?’ asks Mainzer (1997: 304). He shows that in a context of many nonlinear interactions, the relevance of individual action is different from that  we used to illustrate by simple linear cause–effect models: the traditional  concept of individual responsibility is questionable, and we need new  models of collective behaviour: ‘it is not enough to have good individual  intentions. We have to consider their nonlinear effects’ (Mainzer, 1997:  324–5).

Complexity and Grids: The Geography of Grey Landscapes  Studies in complexity show that if certain features of the system can be  identiﬁed, they may reveal important aspects of the expected patterns of  events. For instance, for a large variety of systems, the size of the largest  possible ﬂuctuation increases with the number of subsystems and with the  strength of subsystem interaction (Suteanu, 1999: 10–11).  What could this mean from the point of view of current tendencies on  our planet? What should a complexity-informed public expect to see in the  future?

First, extensive multi-level fragmentation (Bohm, 1983) has a direct  impact on system dynamics. A fragmented world means more subsystems  in interaction. Second, a globalized world involves more and stronger interactions among subsystems. Both of these tendencies point towards an  ‘enhanced’ dynamics: if large events are perceived as ‘crises’, this could  involve longer and more dramatic crises, as well as larger areas affected by  these crises. What does this mean for the world citizen? The public cannot  answer this question. Most probably, the specialist cannot answer it either,  without studying complex models in detail and comparing them constantly  with real facts in the evolving world.  What the complexity-educated public would probably notice is that  signiﬁcant ﬂuctuations occur, mainly in the realm of information. We are  facing a more and more interconnected world, and an accelerated ﬂow of  information, money and objects. Lash and Urry (1994) highlight that the  latter are ‘emptied out’ of material content: the entities subject to faster ﬂow  are increasingly ‘signs’ rather than objects. Information is dominant in the  current circulation and exchange dynamics. As mentioned above, according to insights derived from complexity, a context that includes more parts  in interaction and stronger interactions among the parts generates or  enhances premises for the occurrence of ‘critical states’. This changes the  picture of global dynamics to include more frequent large events and  increased size of the largest crises.  While large events are usually related to crises (Bak, 1996), one  should be aware that this does not always have to be the case. A sizeable  event may be perceived as ‘bad’, but also as ‘good’, it may be a huge failure  or a great success. However, this is not the perspective one can usually ﬁnd  in articles about systems in a critical state. The most probable reason why  large ﬂuctuations are considered equivalent to crises is the fact that they  involve dramatic changes in the world where they occur, and abrupt changes  can be traumatic.  If this is what the public came to discover with the help of the media  and its metaphors, the emerging landscape could lead to a decidedly  pessimistic worldview: a grey landscape of waves of all sizes surrounding  us, until a really big wave hits, which we can neither foresee nor avoid.  When contemplating such perspectives, it is quite easy to forget for a  moment the number of (over)simplifying facts included in the scenario.  Complexity and Networks: A Different Geography?  Is the landscape outlined above really ‘the’ implication of what we know  about complex interacting systems? Is this what we should expect to creep  into the realm of popular culture? Actually, there are some details to be  considered that could change this picture, at least to some extent.  First, let us refer to the increasing number of subsystems, which is a direct effect of widespread fragmentation. David Bohm (1983) rightly identi-  ﬁed here one of the key problems of our society. However, what complexity  seems to provide as a surprise, apparently unforeseen by David Bohm, is  the changing nature of the boundaries of these fragments. The shift to an  information society makes interactions different: they are, in fact, less dominated by system boundaries. In the words of Mark Taylor (2001: 19): ‘walls  which once seemed secure, become permeable screens that allow diverse  ﬂows to become global’. Depending on the interaction rules, a lack of clearcut subsystem delimitation (and a decreased contrast between neighbouring subsystems) can change the character of the overall system dynamics:  this may decrease the size of the largest ﬂuctuation.  There is also another reason for questioning the ‘grey landscape’  suggested above. The insights cited in the preceding section refer to models  and experiments relying on grids. Grids are usually based on identical or  similar discrete elements interconnected in a spatially uniform way, and  governed by a set of local interaction rules (Wolfram, 1983).  Mark Taylor (2001: 20) correctly observes that we are experiencing a  shift ‘from a world structured by grids to a world organized like networks’.  Functionally, networks can be quite different from grids (Barabási, 2003).  They are characterized by a large diversity concerning their topologies and  their relations systems or ﬂow-patterns (Barabási, 2003; Urry, 2003: 51–9).  Cellular neural networks (which include grid-like cellular structures) also  produce a large variety of dynamic behaviour, depending on their evolving  parameters (Dogaru, 2003).  Assimilating the predicted behaviour of an increasingly globalized  world with the grid-like systems dynamics in a critical state is thus, rigorously speaking, not fully justiﬁed. The good news is that the idea of a ‘grey  landscape’ evoked above is not supported by network models: the diversity  of possible dynamic regimes is extremely large, and there are no actual  scientiﬁcally supported reasons to forecast such a dark landscape. The bad  news is that, lacking precise information – which is hard to obtain even in  the case of ‘simple’ physical systems – we do not have means of foreseeing  a precise type of behaviour either: if the network landscape is – unlike the  grid-dominated one – coloured, the actual ‘colour’ will be hard to predict  (Dogaru, 2003).  The world of information typically functions in a context dominated  by networks which are capable of inﬂuencing the information ﬂow and which  are shaped in their turn by the evolution of this ﬂow. Network topology  studies show that in many cases there are a small number of nodes with a  special role, having a privileged, particularly broad access to other nodes  (Adamic et al., 2001). The channelling of information ﬂow (for example on  the Internet) occurs within the framework of a ‘real’ geography, correlated  with a virtual geography belonging to an almost ghostly system, the  components of which cannot be elucidated by most of its users. The latter  are linked by a kind of magic relationship, which acts along physical  channels that span the planet, without being revealed to those who  130 Theory, Culture & Society 22(5)  07\_suteanu\_057196 (jk-t) 20/9/05 8:58 am Page 130  Downloaded from tcs.sagepub.com at UNIV OF TEXAS AUSTIN on March 1, 2011participate in the game of information interaction. What counts are not the  physical pathways taken by information, not the tracks in the ‘real’ geography, from server to server and from the earth surface to satellites and back  to the surface, but the role of the participants in the game, their functional  attributes, their position in the virtual context, which is subject to change.  In other words, networks seem to be more difﬁcult to elucidate than  the already familiar ‘grids’, and network models appear to be more likely to  leave out aspects of the real world that could be relevant for the resulting  system behaviour. For example, the all-linking system of accelerated information ﬂow has the tendency to absorb information in its entirety, emptying  the communicators of the substance to be communicated. News exchange  becomes faster than the accumulation of facts to communicate, changing the  nature of people’s correspondence: missing the accumulation of facts to be  narrated, people may give up narration altogether, and the interaction either  shifts towards a reﬂective process occurring around the generation and the  regeneration of meanings, or it concentrates on the communication of ‘states’,  moods, etc., evoking them by means of a speciﬁc language developed for  this purpose (Munteanu, pers. comm.). These processes involve the superfast spreading of something similar to the ‘waves’ studied in the ﬁeld of  complexity, where the propagation of critical states occurs among physically  adjacent components. However, in this instance, we are dealing with  components that are adjacent in virtual space. The neighbourhoods in this  network space are dynamic; sometimes they change very quickly (Urry, 2003:  9). Such a system encourages transparency, denouncing any act of concealing something in the ‘shadows’; in practical terms, the communication system  in such a network is shadowless. Participants are exposed and information  about their activities may appear in the most unexpected places; this has an  impact on the ethics of communication. The ﬂexible information-dominated  context does not have a predetermined shape: its structure is always reformulated or ﬂuid, matching the nature of information movement, which is  often described in terms of ﬂuid behaviour (ﬂow, leakage). Looking at the  world picture as a whole, Urry (2003: 140) speaks about an emergent ‘cosmopolitan global ﬂuid’, in which the ﬂow of information plays a major role.  The Emerging Surprise  The word ‘emergent’ at the end of the preceding paragraph is signiﬁcant. It  points to a very important feature of complex systems.  As if highly irregular space–time behaviour were not enough, as if the  sensitive dependence on initial conditions were an obstacle too weak to  signiﬁcantly affect prediction abilities, there is one more factor that appears  on the stage of complex system dynamics. This factor is more powerful –  and even more surprising – than any deus ex machina of our ancestors.  Known as ‘emergence’, it may affect complex systems in ways that are hard  to predict: actually, the deﬁnition of emergence is directly related, according to Chalmers, to surprise effects (David Chalmers cited in Dogaru, 2003:  2). Statements such as Michael Polanyi’s are very suggestive: ‘Take a watch  to pieces and examine, however carefully, its separate parts in turn, and you  will never come across the principles by which a watch keeps time’ (Polanyi,  1959, The Study of Man, cited in Cambel, 1993: 23). The fact that new properties may appear at higher hierarchic levels without being ‘explained’ by  interactions at the lower levels is so noteworthy that some scholars consider  it a key feature of complexity (Thrift, 1999: 33). Of course, sociology is  particularly interested in emergent phenomena (Mayntz, 1997: 313). The  fact that the latter are increasingly well understood, and in many situations  mathematically formalized in the natural sciences, affects expectations  concerning their successful application in other ﬁelds. Smith (1997: 57)  underlines both the signiﬁcance and the difﬁculty related to applications in  the social sciences, noting that ‘almost nothing about social systems is  suitable to being understood as an aggregative product of lower-level  entities’. Understanding the concept of emergence is by no means equivalent to the capability of explaining how emergence actually works in a given  context. If prediction is already affected by the sensitive dependence on  initial conditions, the possibility of dealing with emergence seems to imply  a drastically increasing uncertainty.  What can one expect to emerge? In what circumstances? How is the  emerging system supposed to behave? The answers to such questions are  so strongly dependent on the ‘details’ of the system (on the studied level of  subsystems, the properties considered, the interaction rules among subsystems, the role of the ‘environment’, etc.) that their generality is limited and  therefore their applicability is often irrelevant. Mayntz points out that,  despite spectacular progress in the natural sciences with respect to  emergent phenomena, and notwithstanding interesting attempts to analyse  social change in terms of non-linear dynamics, we still lack ‘a sociological  theory of discontinuous social processes’, which should be ‘a genuinely  sociological theory’ rather than ‘a mere reformulation of existing insights [in  physics]’ (Mayntz, 1997: 310–11).  Under these circumstances, what are the expected effects on a public  supplied with information by a media system that is, in its turn, fed by scholarly outputs that are not sure about the answers? This situation seems to  provide an increased opportunity for the media to ﬁll the voids with the kind  of material it will prefer for its own purposes, since – on the ﬁeld of uncertainty – there will be so many ‘theories’ to choose from. A foreseeable  scenario would thus include a large diversity of future ‘worlds’ selected and  described in a way that would contribute to the media’s success. Key words  such as ‘spectacular’ and ‘fearful’ would probably abound in descriptions of  this new landscape.  The New Geography of Interactions and Time  As pointed out in the preceding sections, possible outcomes of complex  systems dynamics can be viewed as crises. Such crises involve large ﬂuctuations, which could represent abrupt changes in certain parameters that  characterize the studied ‘world’. The moment when crises emerge, their size  and their nature, all depend on the details we include in our model. For  instance, for crises to emerge in the communication context discussed  above, transmission is not sufﬁcient; a mechanism of accumulation must  also exist. In the network-dominated game of interaction among various  actors, accumulation varies in time and in space. Such accumulation usually  concerns material goods as well as other entities, such as money or information, or even subtle cultural aspects (Suteanu, 1999). Fluctuations in the  magnitude and movement of these accumulated entities represent events,  some of which are large enough to be perceived as crises; this happens when  ﬂuctuations propagate throughout the system, creating ample avalanche-like  processes. What accumulation mechanisms could we have in this case? The  dematerialization of transferred goods changes the problem of stock ﬂuctuations and their relation to storage, production and absorption rate.  However, the accelerated rhythm characterizing the new dynamics brings  about a new synchronization among economic actors, and between these  actors and the various types of consumers. Beyond ﬂuctuations in offerdemand dynamics in this network context, one may speculate that an  important factor could be the emotional state of the communicators. The  increasing role of emotional states in personal communication, as well as  their focused use by the media, from news to advertising, support this idea.  The network is characterized by a fast rate of transmission, which comes  close to or even exceeds the pace of emotional dynamics.  Complexity theory teaches us that interacting processes with matching  time constants may lead to resonances, and resonances are at the origin of  major transformations (Prigogine, 1980), although the exact outcome of such  phenomena is difﬁcult to predict. What I would like to emphasize here is  that the acceleration of interactions and their predominantly informational  nature do not simply mean that things occur faster. If we modelled this  process, what we would see is not simply a more rapid dynamics, as if the  model were running on a faster computer. The pace of communication will  always interact with the rhythm of various parts of our system. Some of these  rhythms are biologically conditioned while others are the consequence of  psychological or social mechanisms. Many, if not all, of these rhythms may  also change when interacting with each other. Depending on their phasing,  these rhythms alone may generate outcomes that could be very different  from each other, encompassing surprising scenarios. However, the situation  is not simple and many other factors can be expected to change too, which  adds to the difﬁculty of making meaningful forecasts. We should be  prepared, therefore, to face unforeseen implications, such as changes in the  quality of human communication and forms of creativity.

## Cmplxty key to Risk Communication-3

**Interrupting the 1AC cultivates our capacity to respond to uncertainty—Their reductionist scholarship erodes public trust in the meaningfulness of political action**

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The new geography produced by the change in the interpretative framework  partially outlined above has already affected the way scholars confront their  challenges. The design of their experiments and data collection processes,  the development and the choice of their analysis procedures and models,  their ability to draw conclusions and, most signiﬁcantly, their expectations  – all have changed considerably (Munteanu, 1999).  Since the new type of landscape cannot be hermetically sealed in  laboratories, the question is not whether the public will become aware of it,  but rather if, and how, people will be affected by the new geography.  There are important aspects of complexity studies that are relevant to  the non-specialist, some of which have already been addressed by the  media. In the case of others, it seems to be just a matter of time for them  to affect the public worldview.  If a scientiﬁc experiment were to address the problem of public  exposure to these new principles, involving a group of voluntary participants, it would require a careful monitoring of the consequences of each  step of the experiment; it would also entail a considerable amount of work  to obtain approval from various scientiﬁc research ethics boards. What  happens now, however, occurs at a large scale, involves people of all ages  and proﬁles, and does not require monitoring or approval at all. We seem  to go at full speed right into a post-experiment phase, in which outcomes  of scientiﬁc exploration are applied without hesitation. It would be worthwhile to consider some of the possible consequences of such a signiﬁcant  change.  Change on the Stage  Sooner or later, in one way or another, the public will meet the new type of  environment. It will learn about the novel features of the surrounding landscapes, and be confronted by the effects of their manoeuvres when they  move around in the fresh geographical context.  Several ideas would most likely stand out.  An example is the multi-perspective approach to complex items and  situations. One would understand that a method which considers large-scale  phenomena, but chooses to overlook the details, may fail in spite of the great  care given to every aspect of the analysis. One would also realize that effects  of certain actions may propagate and become signiﬁcant at other scales than  those at which a process has started.  An important insight would concern the unavoidability of large events  in the most varied ﬁelds of human activity. Despite remarkable progress with  respect to event prediction and mitigation (McGuire et al., 2002), people  could realize that large events will always exist. So-called ‘catastrophes’ are  not expected to be banned from people’s lives, whatever technological  progress we make, because they seem to be embedded in the functioning  rules of the world.  The realization of the intrinsic limits concerning event prediction and  control will also change people’s interpretation of the world and of their  relations to it.  However, despite an incipient dissemination through sporadic  appearance in the media, the new geography with its new rules has not really  reached the public. Not yet.  What will be the reaction of the public when it ﬁnds itself in the middle  of a new landscape? The answer will probably depend on the way in which  such knowledge reaches the public. Will it be mainly in loose fragments  emitted as news by the media? Will it be mostly by universes created in  movies or novels, including virtual books? Will it be through teaching,  starting in the early school years? Probably all of these ways and many  others will be active, some of them becoming the dominant channels at  different points in time.  At present, a dichotomy exists between scholars and the public with  respect to access to complexity theory. Signiﬁcantly, a part of the public  often referred to as decision-makers ﬁnds itself in a special situation. Given  the importance of their understanding of complexity principles, many of  them have already learned more about the subject. The pressure exerted by  scholars may also play a role in the process. As Gunnar Kullenberg (1998)  declares, ‘research and decision-making paradigms should move away from  a deterministic approach to an integrating, conjunctive and risk-assessing  one which acknowledges the complexity and chaos-orientation of the whole  system’.  Scholars, in their turn, are increasingly confronted with the realm of  complexity. Some are dissatisﬁed with current achievements. Hans Jonas  (1992), for instance, has shown that, despite the great transformations that  have occurred, the essential seems to have been left unchanged, including  the notion of quantitative and aimless causality, the obsession with the  measurability of the real and the lack of effectiveness of the immeasurable,  and the alienation of subjectivity in a system dedicated to objectivity. In  contrast, other scholars, among whom Prigogine stands out, passionately  reveal a new path offered by complexity: ‘we still cannot predict where . . .  [it] will lead, but what is certain at this point is that it has generated a new  dialogue [with nature]’ (1980: 215), an important dialogue because it will  aid our reconciliation with the world (Prigogine and Stengers, 1986). We  should be able to accept the dynamics of our world, both in terms of accelerating rhythm, and in terms of conceptual change. For instance, in our  interpretation of the world, we must consider the possibility of a certain  evolution to change both the meaning and the pertinence of the terms we  have used to describe it (Prigogine and Stengers, 1988: 195). Public awareness of the nature of complex dynamics would support the understanding of  so-called ‘failures’ of science: for instance, the reasons why the study of  complex natural systems does not always lead to the expected clear answers.  This would shed more light on the real nature of complex problems such as  global environmental change.  At the same time, according to certain scholars, ‘liberation from  certainty’ and acceptance of uncertainty also seem to be part of the future  picture: ‘certainty has long been associated with a denial of time and creativity’ says Prigogine (1997: 184). Despite their fascinating consequences in  the natural sciences, such ideas should be considered with caution: ‘liberation from certainty’ may be seen differently in the social realm. However,  education will certainly help us to understand uncertainty better, to successfully accomplish a shift in mentality towards openness to uncertainty, to  cope with the feeling of vulnerability and even to endorse rapidly changing  forms of originality.  Complexity brings forth a new relationship between scholars and the  public. The deepening specialization seems to lead to an ever-growing  divide between them. The current patterns of change, the nature of complexity and its apparently unavoidable multi-faceted impacts, tend to bring them  closer together. Better thought-out and better implemented communication  seems to be important. How can we reach a more coherent vision, shared  by scholars and the public, regarding key features of complex systems  dynamics? Who is expected to do something about it? Should one just wait  for the ‘system’ to self-organize? One possibility is that scholars are the ones  expected to speak. And when they do so, they should address not only their  fellow scientists, but also the public. The media, with its huge variety of  expression and its tremendous development, could be recognized by  scholars as a key component of the complex system they try to investigate,  a component that should not only be studied theoretically, but also one that  should be deliberately and responsibly involved in the new geography.  Contextual learning and information dynamics in a fast evolving social  environment, which incorporates technology that shifts forms and roles,  cannot be neglected either.  However, it should be pointed out that the word ‘public’ used here may  be misleading. It could suggest a passive audience, whose interpretation of  what occurs will only affect each person’s worldview. The public works to  construct and reconstruct the geography, the stage on which it plays, and a  changed interpretation of the play will modify the way people construct and  the way they act, which, in turn, will affect the interpretation process.  Anybody attempting to foresee and to affect the path of this evolution has  to confront the challenges of complex dynamics. Complexity theory seems  to provide a guarantee that the future remains open to new developments  and surprises. However, anybody trying to foresee and to inﬂuence this  evolution will also have to be on the stage; there is no way to prepare backstage. As Gandhi said (Sen, 1960: 242), ‘It is unwise to be too sure of one’s  own wisdom. It is healthy to be reminded that the strongest might weaken  and the wisest might err.’

## Cmplxty key to Risk Communication-4

**Evaluating communication canNOT start by evaluating their intended meaning—You must instead look at the non-linear effects produced by their claims to predictive control**

Cristian **Suteanu 2005**

[Professor of geography and environmental science at Saint Mary’s University “Complexity, Science and the Public : The Geography of a New Interpretation” *Theory, Culture & Society* Vol. 22(5): 113–140] I

It is precisely the advancement in complexity, both in its conceptual framework and in its methodology, which provides powerful tools to cope with the  ‘wild’ dynamics of complex systems (Sornette, 2000). And yet, here lies also  the source of insights concerning limits in our capability to make predictions. The lesson of the Lyapunov exponent mentioned above (in the subsection, ‘“To Be Reproducible”: Admitting Uniqueness’) means that  complex dynamic systems may pose information-related obstacles to interaction with them. Sensitive dependence on initial conditions and perturbations affects one’s capacity to predict their behaviour.  The degree of predictability does not depend exclusively on technological limits, which means that it does not change to suit the rhythm of  technological progress: in the case of chaotic systems, we have to multiply  our technological effort many times over to reach only moderately enhanced  results, and these enhancements weaken fast when we go further in time.  This is not to say that signiﬁcant progress with respect to dynamic system  prediction has not been made or will not be made in the future, nor does it  suggest that there are limits to achievable progress. However, this problem  points to profound sources of constraints regarding predictability.  For the public, an inevitable implication is that science really has a  problem: it will never be able to predict accurately the dynamic behaviour  of chaotic systems. In fact, instead of an expected breakthrough in this domain, science has provided proof that its ‘failure’ has solid foundations.  The feeling of vulnerability can only be enhanced thereby.  If prediction is such a challenging problem, what can be expected in  terms of control? The answer here is not quite so negative. Based on principles of complexity, the resourcefulness of scholars has led to methods of  what is called ‘chaos control’ (Ott et al., 1990). The idea is that if the system  is unstable, and you know when, where and how to act upon it, you can  guide or control it, using very little energy to do so. Instead of a large amount  of energy, you need information. Spectacular technological applications  have already begun to emerge (Boccaletti et al., 2000).  What does this imply for the public worldview? Does this mean that  any complex system could be, in principle, subject to control? Studies of  systems with many degrees of freedom show that control is hindered by  fundamental factors: while knowledge about the details of system conﬁguration is essential, these details change constantly as a consequence of  system functioning; in other words, an action prepared for a certain situation can (and does) meet new conﬁgurations, which can lead the system  along another evolutionary scenario than the one envisaged (Suteanu, 1999;  Suteanu et al., 1997). Despite such obstacles, the future remains open to  new and possibly unforeseen progress in this direction. If scholars are  enthusiastic about these possibilities, such prospects are not necessarily  reassuring for the public, who would unavoidably envision new sources of  manipulation.  However, even in absence of an explicit goal related to the control of  others, uncertainties about the future of the nature of freedom in a system  made of many interrelated and strongly coupled subsystems, sometimes  emerge. In a book that does not enjoy the dissemination it deserves, Florin  Munteanu (1999) explains how mechanisms of fear-induction and escalation in social systems are related to concepts of complexity, starting with  scale-transcending feedback processes. ‘What is the chance of human  freedom in a world of high complexity?’, ‘What is the degree of individual  responsibility in a complex world of collective effects with high nonlinearity?’ asks Mainzer (1997: 304). He shows that in a context of many nonlinear interactions, the relevance of individual action is different from that  we used to illustrate by simple linear cause–effect models: the traditional  concept of individual responsibility is questionable, and we need new  models of collective behaviour: ‘it is not enough to have good individual  intentions. We have to consider their nonlinear effects’ (Mainzer, 1997:  324–5).

## Cmplxty key to Risk Comm… Clear Away Dead Wood

**We control uniqueness—**

**Reductionist methods of communicating predictions backfire because of public mistrust—Interrupting the 1AC narrative solves by clearing away the dead wood.**

**Gurri 2011**

[Martin Gurri, Director of National Intelligence Open Source, July 13 “The extinction of narratives in an age of distrust”

http://thefifthwave.wordpress.com/2011/07/13/the-extinction-of-narratives-in-an-age-of-distrust/]

To persuade the public, a message must be embedded in a shared *narrative*.  This is how our species converts information into action:

we tell a story.  More accurately, we dwell inside a series of nested stories.  I tell a story about myself, nested in a story about my family and nation, itself nested in a *master narrativ*e about cosmic meaning, about what every human life – yours and mine included – is meant to achieve.

EverBecause narratives explain the way of the world, they influence our behavior directly.  Persuasive rhetoric rides the wave of these shared explanations.  [President Obama](http://voices.washingtonpost.com/44/2009/01/president-barack-obamas-inaugu.html) invoked the widely-held story of the US as a land of opportunity for immigrants and pioneers, when calling for a resumption of “the work of remaking America.”  The president appealed repeatedly to the Founding Fathers and the constitution.  He framed his call for change as a return to the true path after a season of misconduct.  Not surprisingly, the [Tea Party opposition](http://www.cbsnews.com/stories/2011/05/25/national/main20065982.shtml) has also made the constitution central to its argument that the president has trampled on our founding principles.  America’s political future will thus be decided by whoever controls the narrative of its past:  a situation that is neither unusual nor particularly paradoxical.  (A fuller exposition of narratives is found in Christian Smith’s [brilliant little book](http://www.amazon.com/Moral-Believing-Animals-Personhood-Culture/dp/0199731977/ref=sr_1_1?ie=UTF8&qid=1310578243&sr=8-1) and Adam Gurri’s [insightful](http://sophistpundit.blogspot.com/2011/06/arguments-as-storytelling.html?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+Sophistpundit+%28Sophistpundit%29) [posts](http://sophistpundit.blogspot.com/2011/07/storyteller-within.html?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+Sophistpundit+%28Sophistpundit%29).)

Once embedded in a narrative, a message must traverse a chaotic landscape – what I have called the [fifth wave of information](http://thefifthwave.wordpress.com/what-is-the-fifth-wave/) – before it can reach its public.  The changes sweeping over this landscape raise obstacles to communication at many levels.  Public attention has fragmented, for example, while the sheer volume of noise has become deafening.  Attempts to communicate must break through the equivalent of ADD behavior.

Here I am concerned with a single transformational feature of the new landscape:  the mass extinction of narratives.

The digital age has been catastrophic to long-standing narratives.  The reason is plain.  Because each narrative purports to explain a shifting human environment, it must depend on some institutional *authority* to act as interpreter and gatekeeper.  Christianity has its bishops, broadcast news its anchormen, government versions of events their elected officials.  Until recently, these accredited middlemen were the only voices heard in the public sphere; their perspectives, buttressed by a near-monopoly of information, were rarely contested. However, the new dispensation has not been kind to mediators.  The rise of the public has meant the overthrow of gatekeepers – often accompanied by the collapse of narratives which imbued the latter with much of their power and prestige.

Consider the case of Abu Ghraib.  Perverse digital images from that Baghdad prison made a hash of a carefully articulated US narrative justifying the invasion of Iraq.  Almost immediately, these images spread beyond the reach of any authority, including the US government.  In a bizarre juxtaposition of two informational eras, the photos of Abu Ghraib were going viral on the web and garnering obsessive international attention, while the secretary of defense pondered whether to make them public.

The Middle East today resembles a graveyard of narratives.  In Tunisia and Egypt, aging rulers – like our secretary of defense – simply didn’t grasp how preposterous their messages sounded in the context of the available information.  Collapse of the official narrative in both countries *preceded* the collapse of the regimes:  when towering figures stood exposed as deformed midgets, their end was close at hand.  In Egypt, and possibly elsewhere, the destruction of narratives appears trapped in an [endless feedback loop](http://thefifthwave.wordpress.com/2011/06/30/a-threshold-moment-egypts-public-up-for-grabs/).  The public now commands the heights of the information landscape, but as the economy falters and the elites maneuver for position it has been unable to cohere around a single story of what should happen next.  Instead it clamors for [more demonstrations](http://www.tahrirdocuments.org/2011/07/until-victory-no-3-the-popular-socialist-alliance-party/), more revolution, more trampling on the sanctities:  inevitably, public opinion has started to fracture along a vast number of fault lines.

Interestingly, the region’s most important *counter-narratives* have also been swept away by events.  [Rejection of Israel](http://www.haaretz.com/news/international/assad-syria-in-better-position-than-egypt-since-it-has-no-ties-with-israel-1.340321) failed to provide [tranquility or legitimacy](http://thefifthwave.wordpress.com/2011/04/21/bloody-syria-in-a-transparent-world/) for Syria’s Bashar Assad.  Al Qaeda’s doctrine that local dictators will never be toppled unless the “far enemy” – the United States – has been terrorized into retreat stands utterly discredited.  Pro-Western or anti-Western, pro-regime or pro-violence – most established ideologies in Arabic-speaking nations are being consumed in a kind of bonfire of the narratives.

This cataclysm isn’t restricted to authoritarian regimes or less developed countries.  It’s global in reach, universal in scope.  The ideal of a “European Union,” which absorbed the minds of continental elites for two generations, is coming unraveled.  President Obama’s 2008 narrative of change failed to survive into the 2010 election cycle.  The authority of journalists, academics, and scientists has been systematically challenged, with disastrous consequences for mediated domains as disparate as the news business, tenure track, and global warming theory.  The slaughter may reach all the way up to the myth of the all-embracing nation-state, leaving us in a state of moral nakedness, as [Anthony Olcott](http://isd.georgetown.edu/files/Olcott_AllThatIsSolid.pdf), quoting Karl Marx, suggests:

***All fixed, fast-frozen relations, with their train of ancient and venerable prejudices and opinions, are swept away, all new-formed ones become antiquated before they can ossify.  All that is solid melts into air, all that is holy is profaned…***

Our century, still young, already is characterized by loss of faith – not only in political and religious propaganda, but in *all* explanations based on authority.  The age of the public is also, in Pierre Rosanvallon’s term, an [age of distrust](http://www.amazon.com/Counter-Democracy-Politics-Distrust-Seeley-Lectures/dp/0521713838/ref=sr_1_1?ie=UTF8&qid=1310579623&sr=8-1), of mutual surveillance between public and government, of ceaseless “denunciations” against individuals and institutions perceived to have committed some wrong.

Marx believed the extinction of narratives would force people to confront the “real conditions of life.”  I’m not so sure.  Marx assumed narratives were, in essence, self-interested falsehoods – superstructure.  Their disappearance left truth behind.  But given the partial state of human knowledge, every explanation, no matter how pure its intent, *must* contain much falsehood, and the demise of any functional narrative *will* result in disorientation and fragmentation such as we find in Egypt today.  Somehow, persuasive messages have to reach the public across divisions of age, class, and ideology:  otherwise, social life comes to a standstill.

Nor are all narratives equal.  This is true in terms of explanatory power, but also of *persuasive* power – not at all the same thing.  Some narratives can survive only by means of terror or brute force.  Others actually convince the public of their usefulness.  It may be that, like the great extinction event of the Cretaceous era, the present slaughter of narratives will clear the ground for new forms, better adapted to convey messages across an altered environment.  If true, the new breed of narratives, as well as the messages they carry, will of necessity rely less on accredited, institutional authority, and will appeal instead to what Rosanvallon calls an “invisible institution”:  reputation.  In an age of distrust, only the standing of the message-sender’s character with the public will confer legitimacy to his message.

## Cmplxty key to Risk Comm… Pol/sci gap (ecol)

**Reckoning with complexity is key to overcoming the policy science gap—Their simplistic ‘consensus’ undermines efforts to mitigate ecological risks**

**Manson 2007**

[Steven M Manson: Department of Geography, University of Minnesota, “Challenges in evaluating models of geographic complexity” Environment and Planning B: Planning and Design 2007, volume 34, pages 245 ^ 260] Manson 9

The exploration of complex systems through modeling makes geographic complexity disproportionately vulnerable to the science ^ policy gap, or the misunderstanding about scientific results and, more broadly, the scientific-research process among scientific, policy, and public communities (Bradshaw and Borchers, 2000). The science ^ policy gap exists in part because of the intrinsic nature of scientific knowledge. There is broad acceptance in the philosophy of science that scientists approximate knowledge by assessing the accumulated weight of evidence for a given positionötruth resides in scientific consensus. This formulation is epistemologically neutral because consensus may be achieved through a realist focus on replication (such as hypothesis testing, independent trials, and confirmatory research) or constructivist channeling of knowledge (such as coercive power relations and discursive practices) (Jasonoff and Wynne, 1998). Consensus is leavened with minority viewpoints and the potential for Popperian falsification and Kuhnian paradigm shifts. The science ^ policy gap is due in part to general misunderstanding about the role of consensus and the potential for falsification in knowledge generation. This gap exists for complex phenomena such as global environmental change and land change because they exhibit confounding behavior (for example, nonlinearity, sensitivity to initial conditions, or self-organization) and because they span multiple spatial and temporal scales marked by lags and cross-scale interaction. As a result, there is a disconnection between tempered, contingent scientific knowledge and the level of certainty often wanted by policymakers. This disconnection can occur in the most deliberative settings, as when judges or juries consider expert witness testimony in courtrooms (Abraham and Merrill, 1986), and it certainly occurs in broader policy spheres, such as governmental legislation with respect to environmental systems (Breyer, 1993). Consider the role of the media in the divide between scientific and lay under- standing of global environmental change. From the early 1990s there has existed broad scientific consensus on the existence of anthropogenic global warming, but this view has always been accompanied by contrary ones (Oreskes, 2004). The journalistic convention of `balanced' reporting translates this broad scientific consensusölarge majority versus small minorityöinto a discourse of balanced views. It also conflates uncertainty about issues such as the validity of hundred-year temperature forecasts with uncertainty about issues over which there is very little disagreement (Boykoff and Boykoff, 2004). The science ^ policy gap will always exist to some extent because models of many systems cannot support full consensus. Oreskes and others (1994) argue that absolute validation and verification of models of natural systems is impossible because the models are simplifications of open systems (only a closed system can be fully validated) and this argument extends to human ^ environment and social systems because they are no less open-ended (Batty and Torrens, 2005). Models therefore can only be evaluated subject to several kinds of uncertainty: theoretical, empirical, parametric, and temporal (Oreskes, 1998), all of which apply to complex models. Theoretical uncertainty, which stems either from not understanding aspects of a system or from encountering irreducible limits to knowledge (Couclelis, 2003), is accentuated by the evolving nature of complexity theory in general and more specifically by the nature of systems to which it is applied. Empirical uncertainty, in which system characteristics are not amenable to measure- ment, is a key challenge to complexity research given the need for large spatiotemporal datasets and the difficulty of defining emergence or deterministic complexity (Zimmer, 1999). Parametric uncertainty, driven by the need for well-specified yet manageable model inputs and relationships, is potentially heightened in complex systems owing to the need to accommodate a range of relationships among system components and evolving definitions of geographic complexity concepts and models (Parker et al, 2003). Temporal uncertainty, or the extent to which the modeled system remains stable or knowable in time, is pronounced in the dynamic, feedback-laden behavior of complex systems, as seen above in the context of complex scale and sensitivity. 5.2 Normal and postnormal science The science ^ policy gap is affected by the relationship between normal and postnormal science. The gap and associated issues of evaluation largely exist under the aegis of normal science, in which scientists convey to policymakers knowledge that has a high degree of certainty or in which scientists can clearly identify the steps necessary to achieve the level of knowledge necessary for policy formation. Normal science there- fore can be characterized as hard science guiding soft policymaking, or cases in which the science for a given issue is quite clear at both a conceptual and technical level, and it only remains for the political process to act on the science. Normal science is still prone to the science ^ policy gap but the gap can be narrowed through research and communication. Postnormal science, conversely, applies to situations characterized by some combi- nation of deep uncertainty, large decision stakes, and disputed values (Funtowitcz and Ravetz, 1994). It is characterized by a situation in which soft science informs hard decisionmaking, or in which the science is uncertain at either, or both, the conceptual and technical level, for issues that require difficult political decisions. As such, post- normal science deals with issues that are largely beyond the science ^ policy gap. Postnormal science is concerned with large, complex systems, particularly those that lie on the interface between environment and human systems, such as nuclear-power generation or global environmental change (Ravetz, 1999). The term science ^ policy gap also implies that science is insulated from society. This notion has been abandoned in the philosophy of science, however, and has been replaced by considerable evidence that science and society are intertwined, especially for complex problems such as global environmental change that have political and cultural overtones. Actors support their viewpoints by characterizing, or mischaracter- izing, model evaluation. Model uncertainty about some aspects of global environmental change, for example, has been purposely used by interests supporting global-warming policies, such as carbon taxes, to make extravagant claims about unlikely scenarios in order to encourage action (Lomberg, 2001), whereas those opposed to these policies parley uncertainty into policy gridlock (Gelbspan, 2004). Though science as a whole is not bought and sold, it is embedded within a larger societal context in a way that is seldom fully appreciated by scientists or the public alike. The potential for surprise in global environmental change further illustrates the nature of postnormal science and its ramifications for geographic complexity. Global environmental change has long spurred debate about the severity of change impacts and the opportunity costs of ameliorating them (Abelson, 1990). These debates center around uncertainty, as when assessing the impact of carbon taxes on fossil-fuel use, carbon emissions, and resultant anthropogenic climate impacts. Uncertainty here is constrained by roughly linear relationships, however, so models find that incremental carbon-tax increases will generally have incremental effects on emissions (Dowlatabadi, 1998). There are other parts of the global environmental system, however, that are prone to larger, abrupt shifts, such as the sudden cessation of ocean circulation or emergence of fundamentally new energy technologies (Schneider, 2004). These kinds of change can Challenges in evaluating models of geographic complexity 255 be usefully studied through geographic complexity but they still have aspects that are subject to postnormal science. 5.3 Discussion Policymakers see models as being arrayed along a continuum ranging from being `truth machines' to merely offering one guess among many (Risbey et al, 1996). This divergence of views is legitimate for models of geographic complexity because they cannot be evaluated fully for various reasons, including incomplete scientific consen- sus, the complex nature and open-endedness of the systems modeled, and intractable uncertainty. Though modelers conduct evaluation in accordance with their epistemic communities, the models are also used outside of these communities, and modelers are therefore partially responsible for how models are used. This is especially true given that there is no strict divide between science and the broader social milieu. Meeting this responsibility requires us to swallow a bitter pillöin some respects better models of geographic complexity will not lead to better policy decisions. The underlying ethos of model evaluation is that decisionmakers can make better decisions if they are given understandable, trustworthy indicators of model validity. GISc and allied fields are constantly improving these methods, but they are limited by the science ^ policy gap and postnormal science for the case of geographic complexity. In some situations the best case scenario is that policymakers can interactively plumb possible system scenarios through models as forms of ``computer-assisted reasoning systems'' (Bankes et al, 2002, page 383). Even if there were no science ^ policy gap for complex systems, they remain the province of postnormal science because they act over multiple spatial and temporal time scales that embody uncertainty and involve high stakes. Decisionmakers are therefore often left with just argument by analogy, such as looking to past climate change as an analog to current change (Glantz, 1991), which can be susceptible to the problems of deduction by analogy found in the conflation of pattern and process. Offsetting these policy challenges requires the inclusion of nonscientists in model evaluation. The public have knowledge and values about problems, such as global environmental change, that are complete, internally consistent, and ethically respon- sible, as when they take into account the welfare of future generations (Zehr, 2000). GISc has a strong history of participatory modeling that is seeing renewed interest through public-participation geographic information systems (Leitner et al, 2000). Incorporating knowledge from a variety of sources leads to the construction of better models, broader model evaluation, and increased decisionmaker understanding of models. This is seen in agent-based modeling efforts that incorporate local indigenous knowledge in understanding the effects of global environmental change (Nicolson et al, 2002) and in participatory modeling of land change for natural sources management (D'Aquino et al, 2003). The explicit inclusion of nonscientists in model evaluation is also important to meet the challenges of postnormal science (Funtowitcz and Ravetz, 1994), which requires us to accept that some phenomena may be beyond modeling, or at least that some models remain beyond evaluation; our ``thinking requires understanding that all models are wrong and humility about the limitations of our knowledge. Such humility is essential in creating an environment in which we can learn about the complex systems in which we are embedded'' (Sterman, 2002, page 501). Models not amenable to evaluation are still useful as heuristic, bookkeeping, or training devices (Hodges and Dewar, 1992). Finally, geographic complexity researchers can consider how uncertainty and the potential for surprise in complex systems contribute to debate on the precautionary 256 S M Manson principleöwhen faced with deep uncertainty and high stakes, such as the potential for catastrophic climate change, how can we act in a manner that is reasonable given the scientific evidence, dictates of cost effectiveness, and the potential for inaction to lead to irreversible harm (O'Riordan and Cameron, 1994)? By understanding the corollaries of the science ^ policy gap and postnormal science, we can identify situations under which society should pursue the precautionary principle in order to address surprising system behavior that can be understood through geographic complexity.

# Specific Topic links

## Link-Urban Design

**Linear models of urban design fail—Integration of complexity is key**

**Meierling 2010**

[Chris Urbina Meierling, College of Design at Arizona State University, “The Construction of Complexity in Design and Public Policy Contexts”

<http://www.drs2010.umontreal.ca/data/PDF/086.pdf>] Meierling 1

**Abstract**

This paper explores the nature of complexity and how it is manifest in the practice of design

research and public policy given their unique contexts. This comparison is made by examining

the tools and approaches that are used in understanding problems and creating outcomes in

each field. This paper is based on a recently conducted action research study at a state

legislature in the United States and is supported by foundational literature on modern problem

theory, decision making, methods, and process in the two fields.

Complexity emerges from the many stakeholders that surround and define our issues, the

enigmatic nature of our ill-structured problems, and the multiplicity of variables that confound

progress towards one solution. An interdisciplinary opportunity is presented; the study

suggests tools are a function of the complexity in any given context and provides examples of

varying modes of managing complexity in design and policy environments. By juxtaposing the

similarities and differences in how design practice and policy development construe and

manage complexity, this paper frames the overlap between the two areas of practice and

builds a mutual space for learning and collaboration.

**Keywords**

Design practice, participatory approaches, politics, policy, human / user-centered design,

methods, complexity, decision making, design thinking

Complexity is very familiar to designers and policy makers. It is present as we struggle to

generate acceptable solutions for as many people as possible, as we ceaselessly reevaluate

the goals of our outcomes and when we carefully seek the sources of the problems our

outcomes attempt to address. We look towards broad strategies, ranging from implicit to explicit,

like collaboration, interdisciplinarity, data analysis, or brainstorming as a means to apply our

thinking in order to acquire a better understanding of our complex environments. Yet, these

strategies have emerged out of the distinct cultures and work contexts of design and policy. An

assessment of the complexity management strategies from each discipline creates a mutual

space for learning and is telling of how our end products are shaped by our approaches and the

way they steer complexity.

This paper suggests that the complexity faced in the design process and the policy making

process is not merely shaped by an existing complex natural state but also by our modes of

management. Complexity emerges from the many stakeholders that surround and define our

issues, the enigmatic nature of our ill-structured problems, and the multiplicity of variables that

confound progress towards one solution. This paper, based on a survey of literature and an

action research study at a state legislature in the United States, actively examines these

characteristics in design and policy by investigating policy tools and exploring how design tools

might be incorporated in the policy context. The transferability of design methods, and

approaches, to the policy making realm has recently achieved great acclaim (DFFN, 2003;

Owen, 2007; RED, 2006), yet there is a paucity of research that has explored this topic in its

real-life context. This examination of complexity becomes particularly valuable in the search for

better public decisions and decision making.

**Research Approach**

This study explores complexity as a boundary spanning phenomenon by asserting that the tools

employed in design and policy are a function of their respective decision-making contexts and

that these tools might be able to be applied across boundary. It weaves together a recently

conducted action research study that explored how design methods might be used in state-level

policy making with relevant literature on problem theory, decision making, methods and process

in the two fields. This mixed approach appropriately poises this research to ask how issues are

constructed and what instrumental roles methods play in the definition and resolution of the

inherently complex problems across contexts (Meierling, 2009).

The primary research used a state legislature as a case study as per Yin (1994) and directly

engaged key stakeholders in the policy process through observation, interviews, and

collaborative modeling of political processes. The research strategy for this study combined

evaluative and applied methodologies in a qualitative approach. The evaluative study assessed

information from a literature review and initial interviews with lobbyists, community members

and legislators to analyze the intersections between design methods, legislative methods and

citizen issues. The applied study introduced nine representative design tools to eight state

legislators in order to explore the relationship to legislative methods. The nine design tools are

as follows:

**Personas** are rich narratives that describe a person’s unique experiences.

**Storyboards** are visualizations that represent a sequence of events and their imbedded

relationships.

**Mind mapping** is a type of diagramming where a person intuitively places related and

potentially related ideas around a central concern in order to classify concepts and to

generate new ideas.

**Systems diagramming** helps understand how complex systems work by visualizing

networks of interrelated issues, their lifecycles, and how they interact with other inputs

**Prototyping and evaluation** involves testing an idea before full-scale implementation.

This can lead to greater success in the full-scale project.

**Research frameworks** segment collected information into relevant, pre-established

categories; this aids in seeing relationships among many issues and ensures all aspects

of a research target have been accounted for.

**Co-creation workshops** gather a group of people to create their own solutions to

problems side by side with expert moderators who keep real-life constraints under

consideration.

**Make kits** allow an individual to show their own experience using words and images

without the imposition of another person. After completion, they are returned to the

research team for analysis.

**Visual representation**, as opposed to verbal, facilitates a different understanding of a

problem through diagramming and explanation, and is adept at clearly showing

relationships.

This phase was also accompanied by in-depth interviews with advocates, interest groups and

policy organizations and a number of observations of legislative processes. A dialogue was

created that collaboratively explored the potential currency of design tools in the policy context

and a path towards design-policy integration.

This paper builds upon established discourse in problem theory and planning. Design and policy

making are both planning activities; they are locked into the transition from 'what-is' to 'what

ought to be' (Buchanan, 1992; Schön, 1994; Simon, 1969). It is within this discourse that

complexity and politics are found to be similarly intrinsic to design and policy (Rittel & Webber,

1969; Dubberly & Rith, 2007). Yet, two different institutions prevail: the design process and the

political process, each corresponding to their own unique methods, or set of tools, and unique

issue contexts. Robert et al. 's (2002) systems framework suggests that disparate systems can

share a common dialectic between the constitution, outcomes, *processes*, actions, and *tools* of

each system. By framing design and policy contexts as separate systems, it is possible to

compare the manifestation of complexity in design and policy development through an

examination of tools.

## Link-Urban Design

**Complexity provides a better framework for urban design**

**Meierling 2010**

[Chris Urbina Meierling, College of Design at Arizona State University, “The Construction of Complexity in Design and Public Policy Contexts”

<http://www.drs2010.umontreal.ca/data/PDF/086.pdf>] Meierling 4

**Using Tools to Frame Complexity**

Actors in the policy drama design policy much as architects or engineers design material

artifacts. They compete and cooperate to set policy problems, and they invent policy

solutions that evolve as a result of the actors’ transactions with the policy situation.

When policy objects are put out into the larger environment, they tend to take on

meanings unanticipated by their designers, as other actors see and respond to them in

the light of their own frames and, often, in a changing policy context (Schön, 1994, p.

xix).

The way in which tools frame complexities, namely the variables, problems, solutions, and

stakeholders of each professional context is revealing of manifestations of complexity. This

paper suggests that the tools are used to manage and organize the aforementioned aspects of

complexity and that they effectively become complexity management strategies that have

emerged from the differing cultures in the two fields. An analysis of these tools reveal four key

areas that are of central importance to design and policy practice yet differ in how complexity

was framed in each field: context, problem definition, value orientation, and participation. The

following accounts describe these areas with specific examples from the aforementioned

primary research as well as secondary sources.

**Context**

Perhaps at the heart of the differing approaches to complexity are the underlying structures and

contexts in which designers and policy makers work. Private and public sectors impose different

constraints on actors and lead to different motivations and actions in practice. A key observation

of the legislature was that it cultivates a short-term mindset even when policies have long lasting

implications. While legislators recognize the value of longitudinal thinking, they want a quick

return on their investment in terms of pushing bills successfully in as little amount of time as

possible. This incremental pattern of policy creation might be prompted by motivations of being

re-elected the following election cycle, the need to see the results of their work for continued

support from their constituency, and the imbedded disposition of a part-time legislature (they are

not salaried enough to live without a secondary income). Issues with long-term consequences

are more difficult to understand and support. It is possible to conclude that this disposition for

the short-term is transferred to stakeholders, thus propagating a cycle of incremental policy

development.

The most generative design tools such as brainstorming might be perceived as counter

productive to developing policies and misconstrued as creating unnecessary risk. The

generation of ideas complicates the approaches taken to gather support from opposition and

other stakeholders and works against the grain of policy development. The context presented in

design is that of selfless dialogue for the sake of generating better ideas, while the context

presented in policy development is that of incremental adjustments that accommodate

stakeholders, yet, both result in collaboratively created outcomes.

An example of these differing contexts can be seen in the way prototyping takes place in design

and policy contexts. When presented with this tool, legislators closely associated it with the use

of pilot studies that are initiated by legislators as a means to test a policy idea. Prototyping or

piloting a policy is valued as a way to bring unforeseen issues to light prior to full adoption of a

bill and as a way test the efficacy of a potential bill. In design, the value of prototyping comes

from quick feedback loops, iteration, and refinement. There are a number of impediments in the

policy process that cause the use of this tool to take a different course: When pilot studies are

introduced to the legislature they need bill approval. In this situation, one legislator would need

to successfully introduce a bill for a pilot study and then reintroduce the bill as a full-scale policy

the following legislative session or after the study period is complete. This process is too slow

when legislatorsʼ concerns lie within one singular session. A pilot can lose support if: another

issue takes prominence; if the sponsor leaves; if money dwindles; or if an idea does not fit well

with the current legislatures concerns. Moreover, long-term projects are difficult to sponsor when

legislators are motivated by quick results that contribute to their reelection. This example shows

that the differing operating paradigms of design and policy are tied to the same need for testing

out an idea and incorporating feedback into a future iteration, yet two distinct ways have

emerged from different manifestations of complexity.

**Problem Definition**

Just as our professional contexts shape the landscape of complexity, so do they dispose the

problems that we face to the constraints, opportunities, and affectations of each field. That is,

problems are identified and defined uniquely to the contexts in which they arise. Problems in the

client-based, business-driven professional model of the design world are shaped somewhere in

between the client, customer and designer. In contrast, the body of individuals who actively

appeal to policy makers characterizes the public context of the policy world: they compete for a

voice in the policy process and for representation in the policy outcome. Problems are

effectively shaped by the voices represented and heard in this process. The significance of how

problems are defined is evident in the manifestations of complexity, the management strategies

of our tools and the outcomes that result.

Problem definition is widely recognized as a contributor to the successes and failures in policy

formulation and carries a long-standing tradition in policy discourse. In part, this discussion

revolved around the notion that issues and problems are shaped by the way people individually

or socially define them and result in policies that are inherently linked to the original problem

construction. For example, homelessness can be considered the result of a shortage of housing,

the result of economic strife, or the product of the deinstitutionalization of mental hospitals

(Rochefort & Cobb, 1992). However, more salient in terms of how complexity manifests itself is

the concept of problem ownership. Rochefort and Cobb (1994) conclude that some problem

definitions may be under complete control of one body of authority. For example, the judiciary

defines the severity of a certain crime through its enactment of retribution and therefore owns a

problem. Another example can be seen when a community organization represents the many

voices of the gay, lesbian, bisexual, transgendered community to the legislature, effectively

owning and taking responsibility over an issue, and as a result omits outlying needs and leaves

them unrepresented. Schattschneider (1960), well-cited for his work in political analysis,

concludes that those who own a problem at the point of definition and through deliberation will

successfully define the solution to it.

Equally important are the means in which issues come to the attention of legislators.

Observation in the research revealed four types of transactions that provide starting points for

problems in the policy context:

**Special interest lobbying** includes the presence of any type of lobbying effort; it can be

ongoing or issue specific.

**Personal experience** refers to any event, either casual or organized that a legislator

personally experiences. These experiences tend to build empathy and can be catalysts

for bill sponsorship or the recognition of an issue by the legislature.

**Proactive citizens** can band together or act individually to voice their needs and

opinions on a particular issue. This may be referred to as citizen lobbying.

**Policy analysis** is undergone by research staff, policy organizations, think tanks, public

interest groups, and other private organizations and serves as a measurement of

efficacy of previously created legislation; policy analysis directly sways which issues will

be heard and which will not.

While paying clients usually represent the origin of problems for designers, the design team

must champion the needs of a user group to encourage a client to take a certain course of

action. However, in the policy context there are numerous ʻclientsʼ with differing agendas and

there is proactive representation that results in uneven depiction of a population's needs. The

divergence of actors and roles of stakeholders delineates how problems are defined and how

our tools shape and are shaped by complexity.

## Link-Inland Waterways

**Ignoring complexity dooms efforts to modernize inland waterways.**

**van Buuren 8**

[Armin van Buuren, Assistant Professor at Erasmus Universiteit Rotterdam, Department of Public Admin, “DECISIONS AS DYNAMIC EQUILIBRIUMS IN ERRATIC POLICY PROCESSES, Positive and negative feedback as drivers of non-linear policy dynamics”, Public Management Review, Vol. 10 Issue 3 2008 381 – 399, 2008]

The Port of Antwerp and the Flemish authorities had asked for a deepening of the navigation channel in order to facilitate the movment of larger ships within it. Nature organizations demanded serious environmental compensation measures for such a potentially harmful operation. Dredging could endanger the fragile equilibrium between the high tide trench and ebb tide trench of the system. Dumping of dredged material in certain parts of the estuary could also distort the natural dynamics of the system. The Dutch Province of Zeeland demanded guarantees for safety against ﬂoods in the estuary and protection against the possibility of accidents involving chemicalladen ships. The province also wanted gains from the broadening, as the estuary is located on their territory while the port is on Flemish territory. Earlier requests to deepen the fairway had resulted in stalemates in the negotiation processes that had lasted for decades (Meijerink 1998). Research on the Westerschelde had for a long time been dominated by Dutch research institutes that had been very cautious in expressing support for moves to 392 Public Management Reviewchange the system parameters of the estuary. The dominant image of the estuary for the Dutch was therefore as a fragile system that was about to collapse. Flemish research – which was much less negative about the possible impacts of human interventions in the system – received considerably less attention in the policy arena as it was perceived to be driven by the desires of the Port of Antwerp. The situation caused the Dutch government to approach any future changes to the estuary with caution. As a result, the existing policy equilibrium state achieved by the decision to deepen the fairway in 1998 was very strong: that this should be the ﬁnal deepening and that ecological restoration of the estuary was a top priority. Internal pressures Fearing that this dominant image and paradigm would prevent any further modiﬁcation of the estuary, the Port of Antwerp Authorities then established their own research team to counter the Dutch claim that further modiﬁcations to the estuary would be harmful. In other words, the aim was to challenge the policy status quo. This research group was baptized the Port of Antwerp Expert Team or PAET. PAET contested the dominant image that the Westerschelde suffered from anthropomorphic changes by putting forward the idea that human-induced changes could assist the estuary in remaining morphologically sound. Initially, PAET’s proposals were just that: ideas offered by some stakeholders that just happened to support their ambition, namely the further deepening of the Westerschelde. This could be seen as an attempt to change the actual policy equilibrium. The Dutch policy-makers were not concerned about this at this stage. However, the process of drafting the Development Outline for the estuary – which was aimed at reconsidering the existing policy equilibrium state and proposing an integrated package of proposals to improve the accessibility of the Schelde ports, the ecological quality and the safety of the estuary – changed this. When this process was implemented, both governments became formally obliged to investigate alternatives to deepening and nature development. Because resources were lacking to start new alternative research, PAET’s research program was included in the research process. From this moment on, the ideas put forward by PAET had to be taken seriously and were allowed to inﬂuence the frames and ambitions of other involved actors. The Dutch frame that the estuary had been damaged by human-induced action had, in earlier decades, led to tight regulations on dredging and dumping activities and detailed descriptions of the necessary operations in regulatory devices. It had also led to a rigid system of dredging permits. Negative factual information strengthened the ambitions of the Dutch to remain cautious about human interventions in the estuary. Early signs of negative consequences of the 1998 deepening on the estuary caused a process of positive feedback to these frames and ambitions. van Buuren & Gerrits: Decisions as dynamic equilibriums 393PAET’s frame in combination with their research results (facts), on the other hand, offered the possibility of restoring the estuary’s ecological state through morphological dredging. The premise of PAET’s argument was that the rigid system of dredging and dumping had to be abandoned for a more adaptive approach that allowed changes on the spot if the circumstances required it and using the dumping of dredged sediments to develop new inter-tidal areas.

## Link-Inland Waterways-2

**Water resource managment is inherently complex—There are too many actors, factors, and interests to be accounted for by their linear model**

**Zellner et al 12**, [Moira Zellner et al, assistant professor in the Department of Urban Planning and Policy and a research assistant professor in the Institute for Environmental Science and Policy at the University of Illinois at Chicago,

Modeling, learning, and planning together: an application of participatory agent-based modeling to environmental planning, URISA Journal Jan, 2012  Volume 24,  Issue1, 1/01/2012

Groundwater is an open-access resource, meaning that users cannot be excluded from tapping into it without incurring very high costs, and each unit consumed by a user cannot be used by any other user. As withdrawals cause cones of depression around wells, the groundwater decline affects neighboring areas, thus making it more costly for others to extract water from the aquifer. Because it is so costly to exclude others from accessing the resource, the incentives are there to deplete it in a literal race to the bottom. Physical and socioeconomic factors contribute to the complexity of groundwater resources. On one hand, groundwater is connected to surface water systems and their replenishment and discharge rates are influenced by biophysical conditions that vary over space and time (e.g., hydraulic conductivity, aquifer depth, aquifer confinement, water levels, soil conditions, vegetation, precipitation). This dynamic interaction makes it hard to anticipate how the resource will respond to either physical changes or human use, or determine how much water is available for a variety of uses. Hydrological studies heavily rely on data collection on various points of an aquifer, but connecting the data over time and space into a dynamic understanding is not straightforward. Land-use decisions also are intimately linked to the spatial and temporal patterns of groundwater levels. When multiple users depend on the resource, differing beliefs of management costs and benefits make it hard to identify the causes of decline and define the responsibility for action. Further complicating the implementation of appropriate measures is the intervention of legal processes where decisions are made based on precedent and resources for litigation, rather than on an understanding of resource dynamics. Therefore, planners and stakeholders need to consider land-use patterns and the factors driving them, how water-use patterns emerge from the spatial distribution of economic activity, and how groundwater responds to these stresses, to ultimately understand groundwater depletion and coordinate action to reverse it (Tidwell and van den Brink 2008, Zellner 2008).

## Link-HSR

**HSR policy that ignores complexity empirically fails—Our framework emphasizing system adaptability solves better than their specific predictions**

van Dam 09[Koen Haziël; Doctoral Student in Artificial Intelligence; “Capturing socio-technical systems¶ with agent-based modeling”; Next Generation Infrastructure Foundation; 32]

A new high speed train connection between the Netherlands and Belgium (“Hogesnelheidslijn”¶ or “HSL-Zuid” in Dutch) has been developed between 2000 and 2006, with the aim to create a faster connection between Amsterdam, Schiphol Airport, Rotterdam and¶ Antwerp, reducing not only international but also local travel time. Plans for this new rail connection were already made in the 1970s, but among other reasons because of the¶ high investments and risks attached to the project it was postponed, until it was finally¶ realised using a private public partnership (PPP) construction in which the parties executing¶ the work will be responsible for design but also long term maintenance and they are¶ involved in the exploitation, for which they receive funding from the government. Vertical unbundling is a reality in the Dutch railway sector too (meaning that an¶ actor is responsible for operation and maintenance of the tracks but several other actors can operate trains on these tracks) so there are many different actors involved. For the¶ new high speed rail this includes a new consortium of (already existing) players which together accepted the PPP project, infra-management organisations and the government.¶ Also for the exploitation of the line a new alliance was formed between an existing railway¶ operator and an airline.¶ On the trajectory some existing tracks are also used (for example between Amsterdam and Schiphol Airport) which adds extra complexity. On top of that, a new security system¶ (European Train Control System, or ETCS) was installed which is hoped to become a¶ European standard, but has not been widely used yet7. Furthermore, the trains that were¶ ordered were not ready in time. The consequence is that slower trains still operate on the¶ old tracks, even though the new infrastructure is ready.¶ Whereas in the example of the vertical unbundling of the electricity sector the physical¶ system stayed the same and only changes in the social system were made, here the¶ changes are mostly in the physical network: new rail routes and a new security system have been installed which are connected to the old physical system, while the same actors are involved. A model of such a system should be able to connect with already existing elements, be flexible in the physical layer to allow the new network elements to be included and should allow existing actors to play the same role, as well as include other responsibilities to be shared between actors.

CONTINUED…

The cases presented in this section have one key element in common: certain aspects of¶ the system remain the same, while others radically change or completely new elements¶ are introduced. Sometimes the social network changes while the physical layout of the¶ network remains the same while in other cases it is the physical network that changes for¶ a given social network. The last examples showed that elements of both the social and¶ physical network are altered, while other parts of both networks stay the same after the¶ introduction of new actors or physical elements.¶ Challenges in the infrastructure domain as considered in this thesis are characterised by the fact that they are multi-actor, multi-criteria and multi-level problems. This means¶ that there are multiple stakeholders with their own goals (which may or may not be¶ conflicting with those of other stakeholders), who have multiple objectives and values¶ (which may or may not be conflicting) and who may operate at different levels of hierarchy. These characteristics make it hard for actors to take the well-informed decisions, but models can support them in the decision-making process.¶ It should be stressed that there is not just one stakeholder in large scale socio-technical¶ systems. With many different actors cooperating or in competition with each other, there¶ will be different interests. The fact that there are multiple actors in the system is one of¶ the characteristics of socio-technical systems. For a decision support tool, however, there is usually only one problem owner for whom the tool is designed. Models of other actors should be included in the system model, but it is assumed that only one is responsible for¶ the assignment to create a model and from this perspective the problem owner is unique. In this thesis different roles of problem owners being supported by models are included,¶ such as governments with a supervisory role or the management of a company.¶ In general in many of today’s infrastructure systems, it is not possible for any one problem owner to directly influence the whole system. For the model to be an effective¶ support tool for the problem owner, it needs to give insight in exactly how changes at¶ lower levels impact the emerging system behaviour. This way of modelling is close to¶ 8¶ Section 1.4. Research objective how it works in the real world: the collective decisions made by more or less autonomous actors at various levels of a hierarchy together result in an overall system behaviour.¶ To help decision makers with a decision support tool, models have to deal with the type of changes that occur (or are being considered) in the real system. The result of this¶ requirement is that social and physical aspects have to be described separately and the¶ model should allow changing them in a modular fashion. Furthermore, new elements¶ in the model should be able to connect to existing parts, just like in the real system new¶ additions to an infrastructure connect to already existing ones.¶ The goal of decision support models is not always to find a system optimum (which¶ is a common goal for many existing models) or predict the future. Epstein (2008) lists¶ “sixteen reasons other than prediction to build models”. Models can, for example, be used to improve understanding of the dynamics of the whole system and subsystems, explore possible futures, find states that have to be avoided or that are desirable, and, most of all,¶ to provide a tool for decision makers to experiment with “what-if” scenarios, etc. Which¶ degrees of freedom are there? What are the possible consequences of certain decisions?¶ What are successful configurations of either physical or social networks? It should be¶ stressed that this requires a wider view than traditional engineering: the systems under research are considered as part of a larger system; the view is one of a system of systems¶ (Hansman, Magee, Neufville, Robins & Roos 2006).

## Link-High Speed Rail

#### Reductionism turns solvency in the context of rail policy—allows politicians to hijack discourse and overestimate costs.

Flyvbjerg, Holm, and Buhl 2005

[Bent Flyvbjerg, Mette K. Skamris Holm, and Søren L. Buhl, Journal of the American Planning Association, Vol. 71, No. 2 Spring 2005]

**Causes of Inaccuracies and Bias in Traffic Forecasts** The striking difference in forecasting inaccuracy be- tween rail and road projects documented above may pos- sibly be explained by the different procedures that apply to how each type of project is funded. Competition for funds is typically more pronounced for rail than for road, which creates an incentive for rail promoters to present their project in as favorable a light as possible—that is, with overestimated benefits and underestimated costs (see more in Flyvbjerg, Holm, et al., ). We speculate further that rail patronage will be overestimated and road traffic underestimated in instances where there is a strong political or ideological desire to see passengers shifted from road to rail, for instance for reasons of congestion or pro- tection of the environment. Forecasts here become part of the political rhetoric aimed at showing voters that some- thing is being done—or will be done—about the problems at hand. In such cases it may be difficult for forecasters and planners to argue for more realistic forecasts, because poli- ticians may use forecasts to show political intent, not the most likely outcome. In order to arrive at a more systematic analysis of causes of inaccuracies in traffic forecasts, we identified such causes for  transportation infrastructure projects. For a number of projects we were able to identify causes of inac- curacies but not the numerical size of inaccuracies. This explains why we have more projects () in this part of our analysis than in the previous part (). Causes of in- accuracies are stated causes that explain differences between actual and forecasted traffic for the first year of operations or the opening year. For the projects on which we collected data, project managers were asked to account for the factors that would explain why actual traffic was different from forecasted traffic. For the other projects the stated causes are a mixture of this type of statement by managers sup- plemented by statements by researchers about what caused such differences. For these projects, the data do not allow an exact distinction between manager statements and researcher statements, though such a distinction would be desirable. A problem with using stated causes is that what people say they do is often significantly different from what they actually do. Identifying revealed causes for inaccuracy in traffic forecasting is therefore an important area for further research. For the time being, we have to make do with stated causes. **Percentage of projects**        Figure  shows the stated causes for inaccuracies in traffic forecasts for rail and road, respectively. For each transportation mode and stated cause, a column shows the percentage of projects for which this cause was stated as a reason for inaccuracy. Again the results are very different for rail and road. For rail projects, the two most important stated causes are “uncertainty about trip distribution” and “deliberately slanted forecasts.” Trip distribution in rail passenger mod- els, while ideally based on cross-sectional data collected from users of transportation systems, is often adapted to fit national or urban policies aimed at boosting rail traffic. Here, too, it is difficult for forecasters and planners to gain acceptance for realistic forecasts that run counter to idealis- tic policies. But such policies frequently fail, and the result is the type of overestimated passenger forecast that we have documented above as typical for rail passenger forecasting (Flyvbjerg, Bruzelius, et al., , ch. ). As regards delib- erately slanted forecasts, such forecasts are produced by rail promoters in order to increase the likelihood that rail proj- ects get built (Wachs, ). Such forecasts exaggerate pas- senger traffic and thus revenues. Elsewhere we have shown that the large overestimation of traffic and revenues docu-mented above for rail goes hand-in-hand with an equally Rail Road  Figure . Stated causes of inaccuracies in traffic forecasts (N = rail projects and  road projects). Trip generation Land use development Trip distribution Forecasting model Deliberately slanted forecast Opening delay/ service reliability Design change Not identified Other large underestimation of costs (Flyvbjerg, Holm, et al., , ). The result is cost-benefit analyses of rail proj- ects that are inflated, with benefit-cost ratios that are useful for getting projects accepted and built. For road projects, the two most often stated causes for inaccurate traffic forecasts are uncertainties about “trip gen- eration” and “land-use development.” Trip generation is based on traffic counts and demographic and geographic data. Such data are often dated and incomplete, and fore- casters quote this as a main source of uncertainty in road traffic forecasting. Forecasts of land use development are based on land use plans. The land use actually implemented is often quite different from what was planned, however. This, again, is a source of uncertainty in forecasting. The different patterns in stated causes for rail and road, respectively, fit well with the figures for actual fore- cast inaccuracies documented above. Rail forecasts are sys- tematically and significantly overestimated to a degree that indicates intent and not error on the part of rail forecasters and promoters. The stated causes, with “deliberately slant- ed forecasts” as the second to largest category, corroborate this interpretation, which corresponds with findings by Wachs (); Flyvbjerg, Holm, and Buhl (); and the U.K. Department for Transport (, pp. –). Road forecasts are also often inaccurate, but they are substan- tially more balanced than rail forecasts, which indicates a higher degree of fair play in road traffic forecasting. This interpretation is corroborated by the fact that deliberately slanted forecasts are not quoted as a main cause of inac- curacy for road traffic forecasts, where they are replaced by more technical factors like trip generation and land use development. This is not to say that road traffic forecasts are never politically manipulated. It is to say, however, that this appears to happen less often and less systematically for road than for rail projects. It is also not to say that road projects generally have a stronger justification than rail projects—just that they have less biased forecasts.

## Link-Airplanes

**Complexity is key to reckoning with the air transport system**

**Dodder 2000**

[Rebecca Dodder, Technology and Policy Program at MIT “The Evolving Systems View of Transportation: Implication for Policy” <http://web.mit.edu/esd.83/www/notebook/Final%20Dodder.PDF>] Dodder 20

Conflicting Systems Views Air Transportation

Breaking from the consideration of urban transportation systems, I will sketch out an example of  how two competing systems views could put the technological trajectory of air traffic control in  civil aviation on one of two distinct paths.  Air traffic management is primarily ground-based, with “efficiency and safely obtained through  the continuous, centralized control…and by the compliance to strict distance rules” (Gras, 1999).

However, Gras argues that this current system of control may be unsustainable given burgeoning  demand for air travel, increasing interactions between different national and regional air traffic   management systems,    as system infrastructure constraints such as the number of airports and  runways. While he does not explicitly invoke Complexity theory, his analysis invokes many of  its core concepts.

The future depends upon the balance between ‘tight’ and ‘loose’  coupling or on the level of determinism that can be maintained. Behind  the apparent authoritarianism of centralization there may well be many  hidden ways to change the rules (Gras, 1999).

As one of these ways to “change the rules” he also points to the idea of free flight, where more  decision-making is delegated to the pilot, using airborne radar and anti-collision instruments and  simple approach guidance. This would break from the more fully controlled flight with the  “plane guided and regulated throughout the flight, compulsory routes with flight levels decided  on the ground, and general flow control” (Gras, 1999). Currently, researchers at MIT are also  developing communication tools that will help enable the development of this type of system.   Researchers at MIT have described free flight as “a system that more or less manages itself”  (MIT, 2000). It is unsure to what extent the concept of free flight will be implemented.  Nevertheless, this example illustrates the importance of the role of information networks, the  way in which that information is processes and used by the system - in a centralized or dispersed  manner - and the behavioral response of the system to that information.

## Link-Airplanes

**Complexity is key to air traffic – prerequisite to the aff**

**Kincaid et al., 08** – Rex K., Department of Mathematics, The College of William and Mary with Natalia Alexanderov, NASA Langley Research Center, and Michael J. Holroyd, Department of Computer Science, University of Virginia (“An Investigation of Synchrony in Transport Networks,” Complexity, Vol. 14, is. 4, 9/2/08, Wiley)RK

A few words about practical matters are in order. We realize that the traditional research in transportation tends to be of a more immediately applied nature. The line of inquiry we are pursuing is very much in its infancy and we cannot even refer (to the best of our knowledge) to similar publications in transportation research. Our only references to similar network investigations are thus far in the realm of the Internet [1, 15]. However, we firmly believe that the ongoing difficulties in implementing profound changes in the present air transportation system (due, in general, to its **immense complexity**) can be, in particular, traced to the lack of predictive modeling. To arrive at predictive modeling—or to understand the limitations of possible modeling—we must start with an investigation into functional relationships that, at first, appear theoretical and somewhat removed from the practicalities of the system. Fortunately, there is a growing recognition of the need for such fundamental inquiries into the nature of complex networks. For instance, a recent NASA Research Announcement explicitly targeted basic research into modeling and active design of transport networks [22]. Thus, we hope that, should an initial emphasis on theory lead to a better understanding of network behavior and to quantitative analysis and design algorithms, we would meet a receptive audience in the transportation community.

## Link-Congestion

**Complexity is a prerequisite for managing transportation congestion**

**Dodder 2000**

[Rebecca Dodder, Technology and Policy Program at MIT “The Evolving Systems View of Transportation: Implication for Policy” <http://web.mit.edu/esd.83/www/notebook/Final%20Dodder.PDF>] Dodder 15

Modeling from the Bottom-up  One area in which one can clearly discern a link to the concepts of complexity theory is in  simulations of urban transportation networks. In transportation modeling, many analysts have  begun to apply the methods of agent-based modeling. The most notable of these models is an  agent-based micro-simulation of urban traffic patterns called “TRANSIMS” (Transportation  Analysis and Simulation System). The model was developed in the mid-1990s by researchers at  Los Alamos National Laboratory, which is not surprising, given the lab’s geographical and  intellectual proximity to the Santa Fe Institute, the hub of the Complexity community. The  model’s developers describes the underlying philosophy of TRANSIMS as the following:  Individual behaviors and their interactions, as constrained by the  transportation system, generate the transportation system’s performance.  To effect that performance in a simulation, individual behavior must be  modeled (Bush, 2000).  Because it is agent-based, the model simulates all entities of the traffic system - from travelers to  traffic signals - as individual agents with specific rules of interaction (Nagel, et al, 2000). The  movement of individuals is simulated in one-second time increments, with each individual  vehicle moving across the cellular automaton grid cells of the transportation network. While the  model breaks from other simulation models in terms of its extremely high level of disaggregation  and adaptive interactions between individuals, many of the underlying concepts evolve quite  naturally from the general analytical shift in transportation modeling that has occurred during the  past decades. This shift includes a move from representing traffic as deterministic flows  between fixed origins and destination to examining the internal dynamics and adaptive behaviors  of heterogeneous agents moving on an uncertain landscape.  In terms of its quality, the model represents a richly detailed and overall accurate description of  the traffic system of Albuquerque, New Mexico, the town for which the modeling technique was  first applied.  6   In addition to recreating features of the actual system such as traffic jams, “the  models has also been used with considerable success to test the effects of ‘perturbations’ of the  system, such as new traffic light patterns or additional roads or bridges” (Gross and Strand,  2000). That said, as new systems modeling practices are developed, in determining the “quality”  of a model, an important consideration is the purpose for which that model is constructed. Gross  and Strand (2000) identify three types of uses for models:  · Predictive models - prediction the future states of a specific, real system,  · Explanatory models - elucidation of “essential” mechanisms, typically of a class of  systems at a more general and/or idealized level,

## Link—Congestion-2

#### Evaluate the affirmative’s framing of congestion first—policy framing shapes implementation.

#### **Lowe, 2011**

[Kate Lowe. PhD at Cornell University. Neighborhood, City, or Region: Deconstructing Scale in Planning Frames. Berkeley Planning Journal 24(1). 2011]

Frames are conceptual and discursive schemata that shape our perceptions¶ of reality and policy issues. In a world of unlimited data and information,¶ frames selectively direct one’s attention to some pieces of information¶ and color how we interpret them. George Lakoff (2004) argues the¶ political right’s use of frames affects how the public understands issues.¶ The phrase “tax relief” is one of his examples. Relief conjures affliction¶ and “a reliever who removes the [tax] affliction…is therefore a hero.¶ And if people try to stop the hero, those people are villains for trying to¶ prevent relief” (p.3).¶ In policy studies and planning, Schön and Rein (1994) explain that actors¶ may reframe “intractable” issues through reflective practice and codesign¶ of policy solutions. Disagreements in policy processes may not¶ simply be about desired actions, but result from tacit, conflicting frames¶ defining the “problem” (Valve 1999). Frames are socially constructed¶ and actors always see the world and phenomenon from their particular¶ positions. Thus, frames cannot be proven or disproven nor correct or¶ incorrect (Schön and Rein). Schön and Rein provide several examples¶ of reframing in policy processes, including homelessness programs in¶ Massachusetts. Initially, state agencies “saw housing as a scare resource”¶ (p.141). Underlying the state’s approach was the “core idea of the market¶ frame” (p. 142). In this frame, “the state’s first response to market failure¶ should be restorative. In the case of housing, the state may restore markets¶ by supporting the supply of housing…and/or the demand for housing¶ exerted by low-income and homeless families” (p. 142). Meanwhile,¶ advocates framed housing as a legal entitlement. By focusing on the¶ perverse incentives in the state’s homelessness programs and using the¶ metaphor of “closing the front and back doors,” stakeholders were able¶ to reflect on and programs and hence redesign them successfully.¶ Because actors identify problems and solutions through frames, frames¶ can have policy effects and thus warrant analysis. Policy frames and¶ stories construct problems and identify solutions (Schön and Rein 1994).¶ For example, Richardson, Isaksson and Gullberg (2010) consider the¶ frames through which policy makers have created congestion strategies¶ for Stockholm. They find some shifts in attitudes toward the private¶ car and the persistence of a “car-based automobility frame” and a¶ goal for “ever increasing mobility.” Because of these guiding concepts,¶ Neighborhood, City, or Region 49¶ implementation measures (including a “radical” congestion tax) aim to¶ control congestion and manage infrastructure systems efficiently, rather¶ than reduce the number of vehicle miles traveled.¶ Recent literature has emphasized the dynamic and continually (re)¶ constructed nature of frames. For example, Fischer (2003) studies (re)¶ framing as a process, rather than as distinct frames. Likewise, Tennøy¶ (2010) adapts Schön and Rein’s work to describe framing as: “a way¶ of selecting, organizing, interpreting and making sense of a complex¶ reality to provide guideposts for knowing, analyzing, persuading and¶ acting. Framing will thus inﬂuence how a problem is understood, the¶ means and strategies that are considered, the analyses and tools that are¶ chosen, etc.” (p.218). I understand frames as a momentary product of the¶ ongoing process of framing, undertaken by multiple actors and drawing¶ on durable but dynamic concepts and structures. My distinction between¶ frames and framing is somewhat artificial, but it allows for a simplified¶ illustration of scale in issue frames.

## Link—Racism

#### Addressing issues of racially divided neighborhoods must address issues of complexity or policy options will face chaos

Wagenaar 07

Hendrik Wagenaar, Leiden University, the Netherlands, Officials Harness the Complexities of Neighborhood Decline, Governance, Complexity, and Democratic Participation : How Citizens and Public Officials Harness the Complexities of Neighborhood Decline, The American Review of Public Administration, Feb 2, 2007

Local preferences of individual citizens, such as the desire to have ethnically similar neighbors or to be friends with someone from one’s own socioeconomic stratum, can lead to a society that is massively segregated along lines of income and ethnic background (Urry, 2003). 8 Neighborhoods and societies thus exhibit the properties of complex systems. If we translate this insight about complex systems to public policy, it has momentous implications. It basically means that the usual strategy of bringing expert knowledge to bear on policy situations is flawed, or at the very least of limited value. Because expert knowledge is primarily aimed at the understanding (and alleged control) of the separate parts of the system (e.g., members of ethnic minorities, food suppliers, school dropouts, employers, etc.), it threatens to miss the emergent properties of the system entirely. 9 Policy outcomes are an emergent property of complex social networks. Second, the transitions of a system from one state to another are not necessarily continuous but can, in fact, be quite abrupt. That is, certain, sometimes even small, changes in the knowledge and information that flows through the connections in some part of the system can suddenly “flip” the system into a state of order or chaos (Kauffman, 1995, p. 78). Again, in policy terms, this is not a far-fetched idea. For example, it has long been documented that the steady inflow of low-income immigrants into an inner-city neighborhood, may, when a certain threshold level is reached, flip the once orderly neighborhood into a self-sustaining negative spiral of crime and urban decay (Wilson, 1978). Abrupt phase transitions point toward the dynamics of system complexity. Interactions in a system tend to be nonlinear, meaning that changes in the separate elements of a system because of information that flows through the system do not add up in a simple additive manner.

## Link—Sprawl

#### Only through the negation of reductionism can we address inner-city racial divisions

Wagenaar 07

Hendrik Wagenaar, Leiden University, the Netherlands, Officials Harness the Complexities of Neighborhood Decline, Governance, Complexity, and Democratic Participation : How Citizens and Public Officials Harness the Complexities of Neighborhood Decline, The American Review of Public Administration, Feb 2, 2007

**C**omplex systems can demonstrate “founder-effects” (small variations in an initial population can make large differences in later outcomes) or punctuated equilibria (periods of rapid change alternate with periods of little or no change), they can be “frozen” in a semipermanent state of dynamic equilibrium or they can descend into a state of “permanent boiling,” where the level of mutation or noise is so high that the system remains in permanent disorder (Axelrod & Cohen, 1999, p. 43; Kauffman, 1995, p. 82). Abrupt phase transitions do not mean that complex systems are by definition unstable. (The decayed neighborhood can be quite stable in its anomic state, unable to get out of it by itself. Or, conversely, many neighborhoods exhibit a typical “character,” despite rapid turnover among its residents.) In fact, complexity theorists are particularly interested in explaining how equilibrium and homeostasis are reached and maintained in dynamic systems, how complex systems “self-organize” into an ordered state. 10 It has been demonstrated, for example, that when certain initial conditions have been met, complex systems, both physical and social, tend toward a state of dynamic equilibrium and might even display a certain robustness. 11 That means that once such a system has settled itself into a dynamic equilibrium, it is not plunged into chaos on the first perturbation of the system. This insight is important when applied to public policy. Policy interventions are the example par excellence of the kind of perturbation to a complex system that may lead to phase transitions. For example, if we conceive of inner-city neighborhoods as complex systems and the policy of urban renewal as an external perturbation of this system, than we could model the effects of this intervention as a phase transition. Again, this is not so improbable as it may seem at first blush. Time and again citizens have told us that after a while the negative side effects of urban renewal build up to point when the neighborhood “flips” to a state of anomie. For the citizens living in such a neighborhood, urban renewal proves to be a fatal remedy. Complex systems have indeterminate outcomes. This is not merely an obvious statement about unpredictability and the concomitant inability to control the everyday world, but a key property of the morphology of complex systems, a property, moreover, that has decisive implications for public policy. The principle of indeterminacy is in fact the negation of reductionism. Where reductionism is backward looking and dictates you to reduce everything in the world to a few simple variables and laws, complexity theory, conversely, is forward looking and shows how a few simple principles can produce the infinitely rich variety and dynamism of the natural and social world (Waldrop, 1992, p. 153). For example, the basic elements of chess are few and simple (a limited number of board pieces, a few rules), but the number of possible moves and outcomes is almost unlimited. 13 Not only do such systems present themselves to the actors who move about in them, as an “immense space of possibilities,” but, to bring this insight back to policy terminology, also no realistic hope exists that complex systems will have an optimal or “one best solution.” The best that actors can hope for is to find fruitful ways to explore this space of possibilities and look for improvements

## Link-Sprawl

Neighborhood/urban link- Neighborhoods are complex systems that cannot be addressed with expert based hierarchical instrumental policy- democratic deliberation harnesses complexity

Wagenaar 07,

Hendrik Wagenaar, Leiden University, the Netherlands, Officials Harness the Complexities of Neighborhood Decline, Governance, Complexity, and Democratic Participation : How Citizens and Public Officials Harness the Complexities of Neighborhood Decline, The American Review of Public Administration, Feb 2, 2007

This article applies complexity theory to urban governance. It is argued that expert-based, hierarchical-instrumental policy making encounters insurmountable obstacles in modern liberal democracies. One of the root causes of this erosion of output legitimacy is the complexity of social systems. Complexity is defined as the density and dynamism of the interactions between the elements of a system. Complexity makes system outcomes unpredictable and hard to control and, for this reason, defies such well-known policy strategies as coordination from the center, model building, and reduction of the problem to a limited number of controllable variables. It is argued that participatory and deliberative models of governance are more effective in harnessing complexity because they increase interaction within systems and thereby system diversity and creativity. Using empirical data from research on citizen participation in disadvantaged neighborhoods in the Netherlands, the author shows (a) that neighborhoods can fruitfully be seen as complex social systems and (b) the different ways in which citizen participation is effective in harnessing this complexity.

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### High Speed Rail Link

#### Reductionism turns solvency in the context of rail policy—allows politicians to hijack discourse and overestimate costs.

Flyvbjerg, Holm, and Buhl 2005

[Bent Flyvbjerg, Mette K. Skamris Holm, and Søren L. Buhl, Journal of the American Planning Association, Vol. 71, No. 2 Spring 2005]

**Causes of Inaccuracies and Bias in Traffic Forecasts** The striking difference in forecasting inaccuracy be- tween rail and road projects documented above may pos- sibly be explained by the different procedures that apply to how each type of project is funded. Competition for funds is typically more pronounced for rail than for road, which creates an incentive for rail promoters to present their project in as favorable a light as possible—that is, with overestimated benefits and underestimated costs (see more in Flyvbjerg, Holm, et al., ). We speculate further that rail patronage will be overestimated and road traffic underestimated in instances where there is a strong political or ideological desire to see passengers shifted from road to rail, for instance for reasons of congestion or pro- tection of the environment. Forecasts here become part of the political rhetoric aimed at showing voters that some- thing is being done—or will be done—about the problems at hand. In such cases it may be difficult for forecasters and planners to argue for more realistic forecasts, because poli- ticians may use forecasts to show political intent, not the most likely outcome. In order to arrive at a more systematic analysis of causes of inaccuracies in traffic forecasts, we identified such causes for  transportation infrastructure projects. For a number of projects we were able to identify causes of inac- curacies but not the numerical size of inaccuracies. This explains why we have more projects () in this part of our analysis than in the previous part (). Causes of in- accuracies are stated causes that explain differences between actual and forecasted traffic for the first year of operations or the opening year. For the projects on which we collected data, project managers were asked to account for the factors that would explain why actual traffic was different from forecasted traffic. For the other projects the stated causes are a mixture of this type of statement by managers sup- plemented by statements by researchers about what caused such differences. For these projects, the data do not allow an exact distinction between manager statements and researcher statements, though such a distinction would be desirable. A problem with using stated causes is that what people say they do is often significantly different from what they actually do. Identifying revealed causes for inaccuracy in traffic forecasting is therefore an important area for further research. For the time being, we have to make do with stated causes. **Percentage of projects**        Figure  shows the stated causes for inaccuracies in traffic forecasts for rail and road, respectively. For each transportation mode and stated cause, a column shows the percentage of projects for which this cause was stated as a reason for inaccuracy. Again the results are very different for rail and road. For rail projects, the two most important stated causes are “uncertainty about trip distribution” and “deliberately slanted forecasts.” Trip distribution in rail passenger mod- els, while ideally based on cross-sectional data collected from users of transportation systems, is often adapted to fit national or urban policies aimed at boosting rail traffic. Here, too, it is difficult for forecasters and planners to gain acceptance for realistic forecasts that run counter to idealis- tic policies. But such policies frequently fail, and the result is the type of overestimated passenger forecast that we have documented above as typical for rail passenger forecasting (Flyvbjerg, Bruzelius, et al., , ch. ). As regards delib- erately slanted forecasts, such forecasts are produced by rail promoters in order to increase the likelihood that rail proj- ects get built (Wachs, ). Such forecasts exaggerate pas- senger traffic and thus revenues. Elsewhere we have shown that the large overestimation of traffic and revenues docu-mented above for rail goes hand-in-hand with an equally Rail Road  Figure . Stated causes of inaccuracies in traffic forecasts (N = rail projects and  road projects). Trip generation Land use development Trip distribution Forecasting model Deliberately slanted forecast Opening delay/ service reliability Design change Not identified Other large underestimation of costs (Flyvbjerg, Holm, et al., , ). The result is cost-benefit analyses of rail proj- ects that are inflated, with benefit-cost ratios that are useful for getting projects accepted and built. For road projects, the two most often stated causes for inaccurate traffic forecasts are uncertainties about “trip gen- eration” and “land-use development.” Trip generation is based on traffic counts and demographic and geographic data. Such data are often dated and incomplete, and fore- casters quote this as a main source of uncertainty in road traffic forecasting. Forecasts of land use development are based on land use plans. The land use actually implemented is often quite different from what was planned, however. This, again, is a source of uncertainty in forecasting. The different patterns in stated causes for rail and road, respectively, fit well with the figures for actual fore- cast inaccuracies documented above. Rail forecasts are sys- tematically and significantly overestimated to a degree that indicates intent and not error on the part of rail forecasters and promoters. The stated causes, with “deliberately slant- ed forecasts” as the second to largest category, corroborate this interpretation, which corresponds with findings by Wachs (); Flyvbjerg, Holm, and Buhl (); and the U.K. Department for Transport (, pp. –). Road forecasts are also often inaccurate, but they are substan- tially more balanced than rail forecasts, which indicates a higher degree of fair play in road traffic forecasting. This interpretation is corroborated by the fact that deliberately slanted forecasts are not quoted as a main cause of inac- curacy for road traffic forecasts, where they are replaced by more technical factors like trip generation and land use development. This is not to say that road traffic forecasts are never politically manipulated. It is to say, however, that this appears to happen less often and less systematically for road than for rail projects. It is also not to say that road projects generally have a stronger justification than rail projects—just that they have less biased forecasts.

## Link—Transit Apartheid

#### Aff culminates in policy planners determining how much taxation is necessary to shift consumer behavior—the lens of cost-benefit analysis maintains neoliberal logic and turns the aff.

Naess 06,

Petter Naess, Aalborg University, Cost-benefit analyses of transportation investments: neither

critical nor realistic, Journal of Critical Realism, Vol. 5, No. 1, 2006, pp. 32-60

The economic valuation of environmental consequences of transport investments projects is probably even more problematic. Apart from the serious problems related to the discounting of long-term effects (cf. the section on ontological assumptions), important epistemological objections can also be made against the valuation of environmental impacts at a given time. As mentioned earlier, the translation of physical impacts into monetary figures is usually made by means of willingness-to-pay investigations. Here, the ‘stated preferences’ approach dominates, although travelling expenses have sometimes been used as a ‘revealed preferences’-based measure of how much people are willing to spend in order to experience a certain natural area is not appropriate when the consequences affect a large geographical area instead of a specific, delimited location.)

Willingness-to-pay investigations of the ‘stated preferences’ type are also encumbered with several validity problems. First, people often do not have sufficient knowledge about the impact of a project to be able to state in a meaningful way how much they are willing to pay in order to make a contribution to avoid this impact. For example, it may be uncertain whether what you measure is the willingness to pay for the entire environmental good (e.g. an outdoor recreation area) or to avoid the negative impact of a proposed project on this area (e. g. in the form of fragmentation, noise and loss of a certain part of its area). The latter would be the relevant measure, but answering this would require quite detailed information – and could the respondents be expected to possess this level of information? Even more problematic, of course, is the use of willingness-to-pay statements as a basis for valuation of a project’s contribution to global climate change. Here, most people (and scientists too!) have far too little knowledge of the various direct and indirect impacts to make meaningful economic statements.

Secondly, for several reasons, individuals’ statements about their willingness to pay do not necessarily reflect their actual valuation of an environmental good. Even in the most commoditized societies, practices of assigning prices to a wide range of items are likely to be unfamiliar, circumscribed, irrelevant or disallowed. In that case the question ‘How much would you be willing to pay?’ is unlikely to elicit responses satisfactory to surveyors.49 Some people may, for example, consider the protection of an outdoor recreation area to be something that should be subject to political decision-making, for which they on grounds of principle should not pay. Such a person may perhaps tick for ‘zero’ as her answer to the question of how much she is willing to pay in order to maintain the opportunity of experiencing the area with the same landscape qualities as today – even if the person is an outdoor life enthusiast and strongly opposed to technical encroachments in the area. In the cost-benefit analysis, however, the answer would be interpreted as if the person were little concerned about protecting the area.

Thirdly, if the establishment or protection of collective goods like, e.g., a publicly accessible outdoor recreational area or clean air is to be left to the willingness-to-pay of individuals, each individual is free to under- communicate her/his real preferences regarding these goods in the hope that others will pay for them.50 On the other hand, it is non-committal for people to state a high willingness to pay. Hardly anyone will be made economically responsible for having stated in a questionnaire that she/he is willing to pay twice as much to finance an environmental good as the person would have accepted in a real-life subscription. According to some economists and psychologists, what people state their willingness to pay for in such studies is a good conscience, not their own utility of the good itself.51

Fourth, in a willingness-to-pay investigation, affluent people have a higher possibility to show a high willingness to pay than those who can afford less (provided that the answers about willingness to pay are honest, cf. above). It is a fallacy to believe that the sum of the amounts of money that individuals are willing to pay is a good measure of society’s total valuation of a good. If one dollar more or less is of a higher importance to some people than to others, aggregated willingness-to-pay is, according to mainstream economic theory, not a precise measure of aggregated utility.52

Fifth, a side effect of a project (e.g. increased possibilities for commercial or industrial development along a new highway) may sometimes be beneficial to some people while disadvantageous to other people. Since willingness-to-pay investigations usually do not record negative willingness-to-pay, but ask only how much people are willing to pay (with zero as the lowest value), a willingness-to-pay investigation in connection with a presumptive positive side effect will only record the valuation among those respondents who have positive or indifferent preferences in relation to the side effect in question.53 (Correspondingly, for presumptive negative side effects, the willingness-to-pay investigation will only record positive or zero willingness-to-pay for the environmental good affected negatively by the project, while those who possibly have an opposite valuation do not count To base decisions about environmental goods on willingness-to-pay investigations is problematic in relation to democratic ideals. This will be addressed in the next section, where ethical and political aspects of the use of cost-benefit analyses of transportation investment projects will be discussed.

Most of the above-mentioned validity problems of willingness-to pay investigations can be traced back to two of the false ontological assumptions mentioned in the previous section, viz. the reduction of social structures and social value to the aggregated individual preferences, and the false assumptions about the human nature (a single-minded homo oeconomicus). This illustrates the point made by Danermark et al. on the need to anchor the chosen research methods in an adequate meta-theoretical understanding.55 Without this, there is a risk that the research methods are used in a less fruitful way – and sometimes even directly erroneously.

# Economics Rationality Kritik

### ER-Link-Cost-Benefit Analysis

#### Cost-benefit analysis fails in the context of transportation policy—epistemologically unsound.

Naess 06,

Petter Naess, Aalborg University, Cost-benefit analyses of transportation investments: neither

critical nor realistic, Journal of Critical Realism, Vol. 5, No. 1, 2006, pp. 32-60

The practice of cost-benefit analysis within the transportation sector is based on a number of untenable ontological and epistemological assumptions:

Social value is reduced to the aggregated preferences of individual consumers - Humans are considered as fully informed, utility-maximizing consumers - Transport modelling analyses based on a misleading ‘local ontology’ among the model makers make up the main input data of the analyses - Nature is dealt with as if it were a mere epiphenomenon of the human world and is assumed to have unlimited capacity to bear growth in consumption and production - Precise, quantitative predictions of travel behaviour and other impacts are considered possible in spite of the necessary crudeness of such forecasts - Willingness-to-pay investigations are encumbered with serious validity and reliability problems, many of which rooted in ontological misconceptions of social value and human nature

Cost-benefit analyses of transportation investment projects tend to neglect long-term environmental consequences and needs among population groups with a low ability to pay. Fundamentally, they serve to legitimate a market-based development within a sector where adopted political goals imply that the hitherto dominating ‘predict and provide’ approach should be replaced by strategies meeting accessibility needs in other ways than through facilitating more traffic.

Instead of cost-benefit analyses, impact analyses evaluating the likely effects of project alternatives against a wide range of societal goals is recommended. In such analyses, quantification and economic valorisation should take place only for impact categories where this can be done in an ontologically and epistemologically defensible way. Uncertainty and the presuppositions on which the analysis rests must be made visible in the presentation of the results.

### ER-Link—Economic Rationality

#### **The Aff’s transportation scenario planning uses instrumental rationality that is separate from actual policy making**

Avineri 2012

(Erel, April 5, 2012, Professor at Centre for Transport & Society, University of the West of England, Bristol, United Kingdom, ” On the use and potential of behavioural economics from the perspective of transport and climate change”, “[Journal of Transport Geography](http://www.sciencedirect.com/science/journal/09666923)”, http://www.sciencedirect.com/science/article/pii/S0966692312000646)

Instrumental rationality has been the traditional espoused paradigm of transportation planning. Pas (1995), for example, outlines a step-by-step planning process along these lines. Transportation planning adopts this definition when it focuses primarily on analytic issues such as data collection, modeling and forecasting, impact analysis, and economic evaluation. This emphasis is reflected in transportation textbooks that commonly devote the majority of their chapters to these matters (e.g., Hanson, 1995). When the concern of transportation planning was cost-effective vehicle movement, instrumental rationality could answer questions about highway sizing, routing, and investment strategy. This form of rationality, however, gave short shrift to questions of goals (which represent ends), often assuming that they are consensual and not controversial or that they are exogenous to planners’ legitimate activities. Transportation planning generally follows a sequence of discrete steps (with feedback loops through the steps). The identification of ends (goals and objectives) usually occurs first. Next comes the selection of means (policies, programs, and projects), which involves the generation of alternatives, analysis, and evaluation. The transportation planner’s role in this process is primarily technocratic—to “predict and provide.” The mismatch between this method and the setting and context for transportation planning is growing. Forester (1989), for example, characterizes decision settings for various forms of rationality, ranging from planning that advises a single, rational-actor decision maker (in a closed system) to planning that engages an ideologically defined conflict where there is no agreement on a single problem definition. Transportation planners rarely encounter the pure scientific rationality setting. Instead, they find differing points of view on decision-making boards, within agency departments, and among interest APA Journal u Autumn 2003 u Vol. 69, No. 4 355 DOES DISCUSSION ENHANCE RATIONALITY? Downloaded by [University of Texas at Austin] at 09:32 23 July 2012 groups. Information is ideological and contested (Wachs, 1985a). Theorists have criticized instrumental rationality on both epistemological and ideological grounds (Friedmann, 1987; Harvey, 1985). Others argue that instrumental rationality also fails to address the realities of political decision making (Meyer & Miller, 1984; Wachs, 1985b, 1995). Altschuler (1979), for example, points out that political systems have a different logic than instrumental rationality—they seek inclusiveness and broad support for policy, for example, rather than a single best answer.

### ER-Link—Econ Rationality\*

Economic Rationality is grounded in fallacy and has been disproven, it is a broken system for transportation planning

Walker, 11

(Fall 2011, Joan L. Walker is Assistant Professor in the Department of Civil and Environmental Engineering and the Center for Global Metropolitan Studies at the University of California, Berkeley. “Are people rational when it comes to making transportation decisions? Are you aware of all of your transportation alternatives?”, “ACCESS: Transportation Research at the University of California”)

THE EFFECTIVENESS OF TRANSPORTATION POLICIES will depend on how users respond to them. Therefore, we must understand how to predict and influence behavior over the long term, which is the realm of travel demand modeling. Relevant decisions made by individuals include where to live and work; the type and quantity of vehicles and transit passes to own; the types, locations and scheduling of activities; and by what modes and routes one travels to those activities. This article explores ways to improve travel demand models to reflect actual behavior, whether it is “rational” or not. The statistical models used for predicting transport-related behaviors are predominantly rooted in the microeconomic paradigm of rationality, which assumes that people can accurately calculate and compare the value of options and then follow the best possible course of action. But are people rational when it comes to making transportation decisions? Are you aware of all of your transportation alternatives? Do you understand and weigh travel times,monetary costs and reliability bymode? Do you choose the alternative with the minimum generalized cost calculated solely from travel times and monetary costs? Or are there other factors that influence your decision such as comfort, convenience, habits, values, or peer influences? Behavioral science researchers have a long history of raising serious questions about the rationality assumption. Their research has often succeeded in pointing out seemingly inconsistent and non-sensible choices. For example, an experiment in the 1970s conducted by behavioral economists Daniel Kahneman and Amos Tversky found that, while most people would travel an extra 15 minutes to save $7 on a new pen, most people would not travel an extra 15 minutes to save $7 on a new suit. An assumption of rationality would suggest that $7 should equal $7 regardless of context. While this behavior is perhaps irrational by some definitions, it is bias in a predictable and measureable direction if what matters is the magnitude of the savings relative to the cost of the item. Instead of assuming that people make mistakes when they act outside of what a narrowly defined theory of rationality would predict, behavioral modeling incorporates intricacies of the decision-making process, such as hidden but systematic rules that govern behavior. If these are not accounted for, it may appear that people are making irrational transport choices. Early transportation planners employed the behavioral assumption that people choose the alternative with the minimum generalized cost, with cost narrowly defined as a function of travel time, the value of that time, and monetary costs. When it was realized that such a deterministic rule was often violated, probabilistic models of behavior became the dominant form. Such models introduce error terms to the preference equations, which is a first step in capturing so-called irrationalities. Probabilistic techniques, such as logit and probit, are still the dominant form in travel demand modeling, and are becoming more behaviorally realistic. It is important to note that rationality is not a fundamental assumption in these models, as “irrational” processes (as long as they are predictable) can be incorporated. In this article I emphasize three different themes based on research I conducted with my students. The first has to do with how people make trade-offs between time, money, and other factors such as environmental impacts. The second has to do with the roles that social influences play in travel and activity behavior. The third is focused on the heterogeneity of travel-related behavior.

### ER-Link—Econ Rationality

#### Rational Actor theory fails – Social Influences drastically affect decision making more than statistical and factual information

Walker, 11

(Fall 2011, Joan L. Walker is Assistant Professor in the Department of Civil and Environmental Engineering and the Center for Global Metropolitan Studies at the University of California, Berkeley. “Are people rational when it comes to making transportation decisions? Are you aware of all of your transportation alternatives?”, “ACCESS: Transportation Research at the University of California”)

Social influences are another source of perceived irrationality. Psychologists and behavioral economists emphasize that we are social beings who are influenced by those around us. However, the statistical framework used to model travel demand is conventionally grounded in individual choice, assuming that choices are made independent of others’ decisions. But when we explored the role of social influences in transport behavior, we typically found them to be important. For example, in the experiments described above we also tested for the strength of social influences on transportation choices. Subjects in the auto ownership experiment were provided with a home and a work context and the commute times by mode. We then asked them whether they would purchase a conventional car (described as having a specific purchase price, annual cost, and annual greenhouse gas emissions), purchase a hybrid car (with the same set of attributes), or choose not to own a car. We also told some subjects in the experiment what their peers in the lab had chosen. We found that the peer information significantly swayed their choices. Subjects were more likely to choose a hybrid car if we told them that a large portion of their peers chose a hybrid car. In the same experiment, we also explored pedestrian safety behavior, namely how different pieces of information influence obedience at traffic signals. We included different types of information aimed at influencing pedestrian jaywalking behavior, including information based on the law, on accident and citation rates, and on the behavior of peers. We then presented subjects with only one of these pieces of information, and asked whether they felt that in the coming week they would cross against red lights more frequently, less frequently, or the same as the previous week. We found that information on the law, citation rates, and accident statistics had no effect. The only piece of information that had a significant effect was the information on peer compliance with pedestrian laws. Unfortunately, telling students that others at Berkeley walk against the traffic signal 28 percent of the time (a statistic based on an informal survey at local intersections) led them to report that they were more likely to cross against red lights in the coming week. We have done other work to incorporate theories of social network effects into travel demand modeling. Using a household travel diary from the Netherlands, we developed a mode choicemodel that incorporates social influences frompeers.We defined peers to be those in the decision maker’s residential neighborhood and socio-economic strata. Then we included as explanatory variables the mode shares of these peer groups. We found these factors to be significant.Modes that were used by one’s social reference groups had an extra level of attractiveness beyond what would be suggested by travel times and travel costs. Note that this effect remains after employing instrumental variables to control for self-selection, similarities in tastes within socio-economic groups, and similarities in transport service within neighborhoods. These social influences have important implications in transport behavior because they suggest a feedback loop between decision makers that can be self-reinforcing over time. This is often referred to as a social-multiplier effect, a bandwagon effect, or herd behavior. For example, with the introduction of a new transportation mode, such as bikesharing or carsharing, a feedback effect between members of a social group can propel the adoption of the new mode over time. The reinforcement may be either in a desirable direction (toward more sustainable or safer behavior) or, as illustrated by the pedestrian case, in an undesirable direction. Themany new forms of social networkingmake this role of reinforcement even more important. These tended to be more affluent families with older children. Another group was the opposite: its orientation was toward urban settings with higher density and more urban activity. Members of this group tended to be professionals and households without children. The third group was primarily focused on transit accessibility, but also on good schools and less dense environments. Members of this group tended to be less-affluent, younger families. The models we used not only provide information on the different segments (or classes) of behavior, but also the size of each segment. In the case of the Portland sample, the division was 43 percent suburban oriented, 27 percent urban oriented, and 30 percent transit oriented. These results suggest that people have strong modal preferences. To study this issue further, we used a six-week household travel and activity diary from Germany (*MobiDRIVE*). The duration of this survey allows us to observe modal patterns and preferences that are difficult to detect in a typical one- to two-day survey. The model results indicate three groups distinguishable by their modal preferences. These are depicted in Figure 3.We use a Venn diagram to demonstrate where individuals fall in terms of orientation toward different modes. Each circle corresponds to one of four main modes: auto, transit, bike, and walk. The first group consists of people strongly oriented toward the auto. These individuals tend to walk when they don’t drive. The second group appears on the opposite side and consists of “green” travelers who prefer not to drive. The third group consists of travelers who have more balanced preferences that include the auto along with transit and/or biking. Note that membership in these groups is based on *preferences*, after controlling for the modal alternatives available for any given trip. The division of the sample was 34 percent auto oriented, 26 percent green, and 40 percent multimodal. These splits are based on the German context we analyzed and would likely be different in the US. In both the residential choice analysis and the mode choice analysis, the models that explicitly allow for distinct market segments provide a better fit to the data than other approaches for capturing heterogeneity. More importantly, the behavioral underpinning of unobserved heterogeneity provides a richer and more robust framework for tailoring different policies to different groups. Further, the structure of the model helps explain behaviors that may appear irrational, such as why people drive even when there are alternatives that appear more attractive.

### ER-Link—Markets

#### **Reject their neoclassical account of markets—equilibrium can never be reached, markets are in flux and consumers can act unpredictably.**

Munro, 95

[Moira Munro. Homo-Economicus in the City: Towards an Urban Socio-economic Research Agenda. Urban Studies Journal Foundation. DOI: 10.1080/00420989550012267. 12/1/1995]

Rosenbery’ s (1960) classic assertion that economics is all about how people make choices; sociology is all about how they don’ t have any choices to makeº (quoted in Baron and Hannan, 1994, p. 1116) neatly encapsulates a dilemma facing those who would wish to make links between sociology and economics to analyse real-world, urban problems in a theoretically grounded way. The scope of and limits to choices and constraints upon the actions of individuals are central to the theoretical conception of and solution to urban problems. The standard neo-classical economics framework analyses rational choices within existing and fixed constraints and subject to existing and fixed preferences. Many problems in the real world require an understanding of those fixed parameters; a solution may require that constraints or preferences, as they operate upon individuals, are shifted or amended. The question then becomes whether analysis of choices can be improved by insights and approaches developed by other \disciplines. This paper examines the currently developing approach of `socio-economics’ and evaluates its potential for contributing to the analysis of urban problems. The economics literature has been characterised by deep doubts about core assumptions of the neo-classical paradigm for many years. (Sen, 1977). For instance, one can look back to the debates about rationality in firms’ pricing and production decisions (Cyert and March, 1963) or about the ability of individuals to deal with the complex world in a sufficiently sophisticated way to judge a rationally `best’ solution crystallised in the alternative `satisficing’ by Simon (1957) for path-breaking work which has profoundly in¯ uenced the way economists think. Such work has opened new approaches in institutional economics (such as principal/agent problems and transactions costs analysis) and in understanding decision-making in conditions of uncertainty for instance. In parallel, there has been a converse move spearheaded by the Chicago School whereby economists have begun to apply a neo-classical, utility maximising model of decision-making to areas hitherto reserved for other social sciences. In work which prompts instinctive outrage in some commentators, economists have explored decisions to marry, have children or commit crime in the traditional framework of an individual maximising utility subject to preferences and constraints (see Becker, 1981). This work has opened debate as to the limits of economic endeavour; is rational choice an appropriate conceptual framework for all areas of human activity? Within specialist ® elds, such as urban and housing economics, the majority of work retains roots in neo-classical models. However, to a great extent, much of what makes the area an interesting and rich area for exploration is that the real world phenomena that are studied evidently do not conform to a simple, neo-classical market model. Urban economists have applied a wide range of the alternative approaches, such as search theory, transactions costs analysis, analysis of imperfect markets and sub-markets, and game theory to tackle the complex world they observe. These elaborations typically preserve the central neo-classical assumption of a utility-maximising individual, while allowing the world in which the individual acts to be characterised by `imperfections’ such as non-market clearing, disequilibrium, uncertainty and government `intervention’. In this sense most of the work can be described as `normal science’, in the neo-classical paradigm. A growing literature in socio-economics seeks to challenge the neo-classical approach wholeheartedly. There are many strands to this critique. Some arise out of the longstanding criticisms made of economic assumptions; others are newer. As yet there is no single agreed set of assumptions or theories which characterise socio-economics. This paper brings together the main strands of the emerging literature, with a particular focus on the work of Etzioni (1988) whose work is arguably the most coherent and influential statement of the socio-economic approach at present. The core issues for this paper are whether the approach has the potential for casting new light on the issues that concern urban researchers and, importantly, whether it can be operationalised. Etzioni (1988) criticises the traditional economics approach on several fundamental grounds. He argues that the assumptions on which analysis is based are ¯ awed and that economics has become sterile, lacking both an understanding of the processes of decision- making and an ability to predict outcomes in a useful way. The issues that socio-economic theory is grappling with can be summarised as follows: Whose welfare is taken into account when making choices and how does others’ welfare affect choices? Ð How are choices made? What is the appropriate unit of analysis for the analysis of choices? Etzioni’s proposed answers to these questions might be crudely characterised as follows: Ð Individuals pursue at least two irreducible utilities, pleasure and morality. Thus, in contrast to a single utility function which motivates action, people can be torn in different directions and decision-making is often characterised by internal conflict. Ð Decisions are made primarily on the basis of values and emotions, they are not `rational’ in the economists’ sense. Ð Social collectivities (households, peer groups , ethnic groups ) are the primary decision-making unitsÐ not individuals. These questions are not new, but the socioeconomic approach provides answers which differ in important respects from standard economic analysis. In the next sections of the paper the arguments surrounding these questions are briefly reviewed and the consequences for urban research evaluated.

### ER-Rational Actor

#### The Rational Actor make decisions that are calculated and used in linear systems like the Affirmative

Quick and Zhao 2011 [ Kathryn S. Quick and Zhirong Jerry Zhao, Assistant Professors, Suggested Design and Management Techniques for Enhancing Public Engagement in Transportation Policymaking, October 2011]

As evidence that travellers do not behave as complete rational behaviours is accumulating,¶ it can be argued that the modelling of travellers’ choices, and its application to planning and¶ policy, can be better addressed by incorporating theories and insights from behavioural¶ economics into well‐established econometric frameworks in both transport and geography¶ (e.g. Ben‐Akiva and Lerman, 1985; Anselin, 2001). However, despite the need for further¶ theoretical and empirical development of such models, researchers and practitioners should¶ be aware of the challenges. For example, Avineri and Bovy (2008) highlight some¶ econometric problems in modelling and estimation of prospect theory models of travel¶ choice, such as heterogeneity and lack of consensus regarding reference point values and¶ difficulties in setting values to other parameters. Such models pose an especially difficult¶ challenge in a travel behaviour context because the attributes of choices can not be easily¶ transferred to economic equivalents. To date, there has been very limited attempt to test¶ non‐parameterized models based on PT/CPT, or to examine the generalisation of¶ parameterized forms of PT/CPT using empirical data (e.g. Xu et al., 2011). The past two decades have seen a rapid growth in the development and implementation of¶ voluntarily travel behaviour change programmes and soft measures, such as travel plans.¶ Although the ‘soft’ elements of such programmes are largely inspired by behavioural¶ sciences theory, and are consistent with the ‘libertarian paternalism’ approach that is¶ associated with some of the thinking in behavioural economics, it might be surprising that¶ there has been so far no systematic attempt to apply key principles from behavioural¶ economics and cognitive psychology to the design of such measures. For example, the¶ underlying paradigm of conventional Personal Travel Planning (PTP) is the traveller as¶ rational decision maker who, when exposed to information about the transport system, will¶ have increased awareness of alternative travel options and choose the option that is most¶ beneficial to him/her. The emphasis is on providing relevant instrumental information¶ without very much consideration of how information is presented (information context), the¶ source of information and the medium used to disseminate the information.¶ A specific challenge for planners and policy makers is to develop measures that might¶ encourage pro‐social and pro‐environmental travel behaviours and eliminate the social¶ dilemma (e.g. reducing car use, congestion and CO2 emissions). Structural approaches to¶ reduce the external costs of transport such as investment in walking and cycling¶ infrastructure, bus priorities, high‐occupancy vehicle lanes and other traffic management¶ measures might be further supported by behaviour change initiatives that incorporate in¶ their design principles of behavioural economics. Choice architecture and in particular¶ ‘social’ nudges might be of specific relevance to programmes characterised by a ‘local’¶ context (such are the Australian approach to voluntarily travel behaviour change, typically involve local government and agencies representing a wide range of social and community¶ interests, and the British experience with travel plans might make). ¶

### ER-Link—Rational Actor

Rational Man Theory Bad – People act upon beliefs, tendencies, and habits, utilities don’t come into the equation. Any attempt at creating a good policy must first rethink its behaviorial models

Avineri 2012

(Erel, April 5, 2012, Professor at Centre for Transport & Society, University of the West of England, Bristol, United Kingdom, ” On the use and potential of behavioural economics from the perspective of transport and climate change”, “[Journal of Transport Geography](http://www.sciencedirect.com/science/journal/09666923)”, http://www.sciencedirect.com/science/article/pii/S0966692312000646)

Travel behaviour is seen by many as the physical outcome (or ‘choice’) exhibited by a traveller and captured by her revealed or stated preferences and actions. Travel behaviours commonly addressed by researchers and practitioners are route choices, mode choices, destination choices, and choices associated with the time to travel. Other actions that can be considered as travel behaviours might include vehicle purchasing and ownership (i.e. number and type of cars owned by household); acquisition of driving license and responses to its control and disposal; parking choices; and pooling or sharing travel arrangements. Micro‐behaviours such as driving styles (e.g. speed, acceleration) are usually not associated with travel behaviour. Although it largely focuses on the aggregated behaviour of individuals, travel behaviour models and frameworks explore other levels of aggregation (e.g., household, organisation, community, and spatial units). In most applied contexts of travel behaviour, the term is used to present the observed actions of travellers (as in the ‘modelling’ and ‘prediction’ contexts). The individual actions that are targeted by interventions and policy measures are also seen as ‘behaviours’. It might be argued by some researchers in the field of travel behaviour that the dynamic economic, cognitive, psychological and social processes that lead to travel choices should also be seen as important elements of travel behaviour, and therefore included in a wider definition of it. This argument could be related to the proposition of the behaviourism philosophy in psychology that all things that humans do can be regarded as behaviours. However in this paper we will apply the more common use of travel behaviour as a term representing observed physical actions. In his review on transport models, philosophy and language, Timms (2008) (following Pas, 1990), distinguishes two main eras of transport modelling: (i) A social physics era (stretching from the 1950s to the 1970s), characterised by the importation of analogies from traditional physics to transport modelling, and concerned primarily with the modelling of (aggregate) systems rather than people; and (ii) an economics era (stretching from the 1970s to the present day), which has been dominated by neoclassical economic concepts, focussing upon the representation of people as individual rational choice makers, interacting together to form a state of equilibrium. The behavioural assumptions on travellers’ choices, and their responses to policy interventions, can be traced back to economic theory and the paradigm of rational man. The development of travel behaviour models in the second era has been largely inspired by models of consumer choice; the principles of rational behaviour, such as individual’s tendency to maximise her utilities were applied to traveller behaviour to simulate choices of destination, mode, route, and time. Although this modelling approach is based on statistical analysis demonstrating levels of association rather than behaviour notions, models of individual travel choice were regrettably termed 'behavioural' (Atkins, 1987). It was argued that this and other weaknesses in the ‘traditional’ models have had negative impacts efficiency of transport planning and policy making (e.g. Atkins, 1987). Gärling (1998) has made the observation that behavioural assumptions of mainstream travel behaviour models are almost always made without reference to existing theories in behavioural sciences (in particular psychology). Ben‐Akiva and Lerman (1985, p.32) describe the theory of choice as a collection of procedures that define the following elements: (i) decision maker, (ii) alternatives, (iii) attributes of alternatives, and (iv) a decision rule. The attractiveness of an alternative in the mind of the traveller is described as a vector of the attribute values (which is later reduced to a scalar, ‘utility’, as an index of the attractiveness of an alternative). If travellers are expected to act as rational human beings, and specifically to exhibit consistency and transitivity in their choices (ibid., p. 38), then the way alternatives and attributes are presented to the traveller, travellers’ set of attitudes and beliefs, social norms and habits should not matter much to choice making, and individuals should not be affected by what might be considered as irrelevant context. However, emerging research findings in travel behaviour research provide evidence on the important roles such (and other) psychological and social factors have on travel behaviours. According to a range of theories in social psychology, behaviour is determined by beliefs and attitudes rather than utilities. In recent reviews (Anable et al., 2006, Bamberg et al., 2010) it is argued that most of the psychological research on travel behaviour change has primarily been guided by two theories: the theory of planned behaviour (TPB) (Ajzen, 1991) and the norm‐activation theory (Schwartz, 1977). According to TPB, the relative strengths of individual’s intentions to perform alternative behaviours guide the choice between them, where the determinants of intended behaviour are a set of individual’s beliefs: attitudes toward behaviour, subjective norms and perceived behavioural control. Norm‐activation theory accounts for pro‐social motives and allocates a central role to personal norms. Although attitudes and believes, and their role in decision making, are explored in the field of behaviour economics, most behavioural economics would not consider social psychology theories (such as TPB) appealing for it postulates a quite strong of rationality. Although neoclassical economics and social psychology have different views of choice making, rational behaviour, in its broad meaning, is still largely assumed by theories such as TPB and norm‐activation theory: individuals faced with choices are assumed to perform a high‐level cognitive process, a process that can be largely described as a planned and consistent. Recently there have been attempts to enhance the utility‐based framework by accounting for latent factors such as perceptions, attitudes, norms, and decision protocols (Ben‐Akiva et al., 2002; Abou‐Zeid et al., 2012). Whilst TPB, which assumes behaviour is a product of intention, provides powerful explanation of behaviour in a wide range of contexts, it can be also argued that some behaviour occurs with little or no pre‐planned intent. In that aspect behaviour can be seen as impulsive, habitual or emotional rather than planned (see, for example, Gärling et al., 1998).

### ER-Link—Rational Actor

#### The affirmative frames humans as rational economic actors—this is empirically denied and leads to failure in policy predictions.

Munro, 95

[Moira Munro. Homo-Economicus in the City: Towards an Urban Socio-economic Research Agenda. Urban Studies Journal Foundation. DOI: 10.1080/00420989550012267. 12/1/1995]

Morals and values, in his view, lead to people facing conflicts between acting according to what they want and what they believe to be right. Etzioni argues that by allowing such actions to produce direct utility alone economic explanations of choice become a tautology ; actors reveal their preferences by what they do, because what they do is what they prefer. The `moral dimension’ is perhaps the most persuasively argued part of Etzioni’s critique. At its heart is that economics misrepresents actions and decisions. People pay taxes, and do not act as free-riders because they have a sense of public duty and notions of what is fair: experiments generally find that people co-operate with each other in experiments with `prisoner’s dilemma’ situations, in contrast to the economic assumption that they will always seek to maximise their own benefits; people give gifts, act altruistically, trust others and obey the law, not because they directly benefit from the consequences of their `good’ actions nor because they fear to get caught behaving `badly’ , but because another motivating force restrains or crosscuts self-seeking. Collard (1991) notes that this moral force can be represented in Christian tradition as the *vox dei* as well as an agnostic moral sense. The idea that people can be `torn’ in decision-making also can account for situations where actions are otherwise contradictory; economic man should not be in conflict over short-run pleasure and longer-run consequences he should be able to make an unambiguous decision to smoke or not, to diet or not or to use an (environmentally unfriendly) car to drive to work without suffering from guilt or having to seek external agents (whether hypnosis or health farms) to enforce the preferred strategy. It might account for inconsistent behaviour, where different choices are made by someone in objectively similar situations. A pertinent question is then what impact it has on analysis to break away from the assumption of unambiguous single-preference functions. Etzioni’ s argument is that by recognising the existence of a moral imperative which, when acted upon, yields a sense of af® rmation, of having done what is proper , and which is substantively different from the pleasure gained from pursuing self-interest, the analyst has an improved framework in which to understand the process of decisionmaking and to predict choices. It is possible explicitly to investigate people’s beliefs and how those beliefs affect behaviour and thus ultimately to improve predictions of how people will act in various situations. This would be expected to enhance understanding of choices in situations which are imbued of morality and carry a sense of *obligation*, because in such cases there is a sense in which people feel that they have no or only a restricted choice. For instance, there is no rational calculus, no continuous evaluation of the costs and benefits of lying, cheating or stealing, because people who believe themselves to be honest generally exclude these options from the range of possible actions. However, as well as absolute moral imperatives there are expedient morals, which is to say that, perhaps in the majority of cases in which some obligation is felt, there still remains a degree of choice. For instance, once a person has decided it is right to give to a charity or is committed to working hard even without direct supervision, there remains the choice of how much money to give or how much effort to put into their work. This is described as moderate deontology by Etzioni (1988). A potential problem with the notion of a `dual’ imperative is that there is no logical reason for there to be only two more or less conflicting motivations A desire for power, for fame (or notoriety) or the attainment of paradise in the next life are all *a priori* equally plausible alternative motivations to set alongside the traditional neo-classical utility maximisation. An alternative conception of a `dual-utility’ function has been explored, for instance by Maital and Maital (1994), who postulate two contradictory urges within people as between a planner and a doer; alternatively expressed as a longer-term/short-term rationality. This distinction, they argue, enables conceptualisation of strategies in which self-restraining or self-regulating mechanisms are used to `save someone from themselves’. For instance, it is well known that it is economically irrational to take a loan if one has savings. Inevitably, the rate returned on savings is less than that paid on borrowing and so it is always cheaper to `lend’ the money to oneself. However, it is commonly seen that people do not behave in this way, because they are not con® dent of being sufficiently self-disciplined to pay themselves back, but will abide by an external agreement for repaying a loan. Similarly, it can be argued that part of the motivation for buying a house to accumulate wealth or to save for old age is to impose a self-restraint mechanism on the temptation to spend income now.

### ER-Environmental Unsustainability

Problematic ontological assumptions of cost-benefit analysis downplays the impact of environmental catastrophe- pollution, loss of biodiversity and loss of biological productivity

Naess 06,

Petter Naess, Aalborg University, Cost-benefit analyses of transportation investments: neither

critical nor realistic, Journal of Critical Realism, Vol. 5, No. 1, 2006, pp. 32-60

As mentioned above, environmental impacts are main items of the cost side of transportation investment projects (apart from the mere construction costs). A final, highly problematic ontological assumption of cost-benefit analyses of such projects is the belief that nature is fully or at least to a very high extent, substitutable with human-made capital, with an unlimited capacity to bear growth in consumption and production. Without this assumption, the discounting of long-term negative environmental consequences down to negative present values much smaller than the originally calculated negative values would not have been possible. The diminishing of future consequences by means of discounting has partly been justified by a psychological phenomenon among individuals (impatience and uncertainty about the possibility to utilize consumption possibilities if they are postponed), and partly by expected economic growth increasing the general possibilities for consumption in a society. However, according to Flemming Møller et al., the psychological time preference related to impatience and uncertainty is hardly relevant for decision-making at a social level, albeit understandable when seen from the perspective of an individual with a limited lifetime. The justification for discounting future consequences therefore rests with the assumption of continuously rising consumption levels.28

How realistic, however, is this assumption in the case of investments in physical structures with a long-term durability and even longer-term environmental consequences? Among the negative environmental impacts, emission of greenhouse gases is one of the most important. The amount of greenhouse gases emitted per kilometre one person travels varies considerably between different means of transport. In addition, growth in the amount of transport contributes, other things equal, to increase the emissions. It is therefore crucial for the ranking of alternatives that the costs resulting from these emissions are calculated in an unbiased way.

However, given an annual discounting rate of 7 percent, as recommended in, among others, USA and Australia, a climate disaster occurring in 150 years causing damage of 10 trillion dollars has a discounted cost today of only 391 million dollars, i.e. an amount twenty-six thousand times smaller than the non-discounted amount29. In other words, the importance of the alternatives’ contribution to climate change is dramatically reduced through the discounting procedure. Needless to say, this places alternatives generating high greenhouse gas emissions in a much more favourable light than what would otherwise be the case, and may lead to the preference of such solutions rather than lower-emission alternatives. In principle, similar bias will also occur in relation to other long-term environmental consequences such as loss of biodiversity and biological productivity due to local pollution and the fragmentation of natural areas represented by transportation infrastructure construction.

### ER-Economic Rationality

#### Economic Rationality is the foundation of the problems we face in todays society – global warming, class warfare, and resource crunches

#### **Petulla 2011**

(Joseph, PHD, March 24, “American environmental history: the exploitation and conservation of natural resources”, <http://www.osti.gov/energycitations/product.biblio.jsp?osti_id=5014950> )

The environmental history is followed in 4 time periods--colonial, the new nation, after the Civil War, and in the 20th century. The author suggests: (1) the economic rationality of American democracy has tended to lead to economic concentration; a waste of natural resources; and evnironmental degradation (also an inequitable distribution of wealth, but this subject is scarcely touched upon); (2) business imperatives, rather than environmental or social concerns, and technological developments have increased the exploitation and processing of natural resources; (3) at the same time, the nation has become increasingly tied together through cheap transportation and regional specialization of resource extraction or processing; and (4) American political policy and legal institutions have generally supported the logic of private enterprise development, promoting and defending individual private property rights over social and environmental concerns, eschewing control of private lands even for purposes of conservation; and also providing abundant government assistance for the profitable purposes of agriculture, lumber, oil, and mining interests. The government has increasingly underwritten the needs of the larger companies representing the more ''rationalized,'' efficient sectors of their respective industries. Nonetheless, sharp criticism of both the economic rationality and the corresponding political policy has surfaced in every age of American social life. This theme is a small but important aspect of the book.

### ER-CBA I/L Magnifier

#### Cost-benefit analysis necessitates environmental destruction in context of transportation planning

Naess 06,

Petter Naess, Aalborg University, Cost-benefit analyses of transportation investments: neither

critical nor realistic, Journal of Critical Realism, Vol. 5, No. 1, 2006, pp. 32-60

As mentioned above, the justification for discounting future consequences is based on expectations of continuous economic growth: If we will be ten times richer in the future, paying a cost of 1000 dollars will impact our welfare much less than paying the same amount of money today. However, in the example above, we are not talking about getting ten times richer, but twenty-six thousand times richer on average (cf. the justification for the discounting rate). Is such an increase in wealth at all possible? A number of studies indicate that the present level of consumption of natural resources and environmental pollution is already higher than what can physically be sustained in a long term.32 A continuous growth in the consumption of natural resources and the ‘throughput’ of these resources into waste and pollution is therefore not environmentally sustainable.33 The answer of neoclassical environmental economists to this dilemma is that economic growth must (and can) be ‘decoupled’ from natural resource consumption and environmental load.34 Such a ‘dematerialized’ growth requires a massive shift to more ‘eco-efficient’ ways of production and consumption, i.e. reducing the environmental load per unit produced of a commodity or a service. If, for example, the resource consumption and environmental load per unit can be reduced to one fourth, i.e. by ‘factor four’, the negative impact of nature and the environment can be halved while doubling the production.35 This line of thought is the base for the so-called ‘factor four’ objectives stated by several environmental agencies since the early 1990s.36

There is evidence that improved eco-efficiency has taken place in several sectors of the economy, and in some cases (e.g. the production of beer cans, energy-saving lamps and electronic equipment) the factor of improvement is high. However, for the economy as a whole, the degree of improvement is modest, and reduction of the environmental load per unit has most often been offset or outweighed by increases in the volume of production.37 In certain sectors of the economy, such as housing construction and transport, a reduction of the per unit environmental load by factor four will be politically highly controversial although technically possible.38

However, when discounting long-term environmental consequences, we are not assuming a ‘factor four’ dematerialization of the economy, but (in the case of seven per cent discounting rate over 150 years) a ‘factor twenty-six thousand’ dematerialization (and even much more if the World Bank discounting rate of 12 per cent is used). The absurdity of such assumptions is probably obvious to everyone except neoclassic economists.39

The separation of neoclassical economic theory from any material context exemplified above illustrates the ‘autistic’ character of this theory, where the axiomatic assumptions are so to speak immune to any corrective inputs from other sciences.40 In critical realist terms, the neoclassical assumptions about discounting and economic growth disregard the dependence of the economic processes on the natural environment, which consists of strata below the strata of individual actions and social structures. Thus, neoclassical economics fail to realize the fact that reality is hierarchically stratified, where each higher-level stratum includes the powers and mechanisms of the lower strata, in addition to the new powers and mechanisms emerging at the higher stratum. While social life cannot be reduced to the powers and mechanisms of lower strata, it still by necessity involves the powers and mechanisms of, among others, physics, chemistry and biology. The neoclassical assumptions about infinite economic growth (and infinite dematerialization) represent a particular sort of ‘downward conflation’ where the powers and mechanisms of the natural world are considered totally controllable by humans as if they were mere epiphenomena of the human world.

### ER-XT: Cognitive Bias

Do not believe the affirmative’s risk calculus because it’s influenced by cognitive bias.

Flyvbjerg 8

[Bent Flyvbjerg, Aalborg University, Denmark and Delft University of Technology, “Curbing Optimism Bias and Strategic Misrepresentation in Planning: Reference Class Forecasting in Practice”, European Planning Studies Vol. 16, No. 1, January 2008]

Inaccuracy in Forecasts Two previous papers in the Journal of the American Planning Association (JAPA) document that forecasts of cost, demand, and other impacts of major plans and projects have remained constantly and remarkably inaccurate for decades (Flyvbjerg et al., 2002, 2005; see also Ascher, 1979; Flyvbjerg et al., 2003). No improvement in forecasting accuracy seems to have taken place, despite all claims of improved forecasting models, better data, etc. For example, inaccuracy in cost forecasts for transportation infrastructure projects was found to be on average 44.7% for rail, 33.8% for bridges and tunnels, and 20.4% for roads (constant prices, see Table 1).1 For the 70-year period for which cost data was available, accuracy in cost forecasts has not improved. Average inaccuracy for rail passenger forecasts was found to be –51.4%, with 84% of all rail projects being wrong by more than+20%; this is equivalent to an average overestimate in rail passenger forecasts of 106%. For roads, average inaccuracy in traffic forecasts is 9.5%, with half of all road forecasts being wrong by more than +20% (see Table 2). For the 30-year period for which demand data was available, accuracy in rail and road traffic forecasts has not improved. When cost and demand forecasts are combined, for instance in the cost-benefit analyses that are typically used to justify large infrastructure investments, the consequence is inaccuracy to the second degree. Benefit-cost ratios are often wrong, not only by a few percent but by several factors (Flyvbjerg et al., 2003, pp. 37–41). As a consequence, estimates of viability are often misleading, as are socio-economic and environmental appraisals, the accuracy of which are heavily dependent on demand and cost forecasts. These results point to a significant problem in policy and planning: More often than not the information that promoters and planners use to decide whether to invest in new projects is highly inaccurate and biased making plans and projects very risky. Comparative studies show that transportation projects are no worse than other project types in this respect (Flyvbjerg et al., 2003). Explaining Inaccuracy Flyvbjerg et al. (2002, 2004, 2005) and Flyvbjerg and Cowi (2004) tested technical, psychological, and political-economic explanations for inaccuracy in forecasting. Technical explanations are most common in the literature and they explain inaccuracy in terms of unreliable or outdated data and the use of inappropriate forecasting models (Vanston & Vanston, 2004, p. 33). However, when such explanations are put to empirical test they do not account well for the available data. First, if technical explanations were valid one would expect the distribution of inaccuracies to be normal or near-normal with an average near zero. Actual distributions of inaccuracies are consistently and significantly non-normal with averages that are significantly different from zero. Thus the problem is bias and not inaccuracy as such. Second, if imperfect data and models were main explanations of inaccuracies, one would expect an improvement in accuracy over time, since in a professional setting errors and their sources would be recognized and addressed, for instance through referee processes with scholarly journals and similar critical expert reviews. Undoubtedly, substantial resources have been spent over several decades on improving data and forecasting models. Nevertheless, this has had no effect on the accuracy of forecasts. This indicates that something other than poor data and models is at play in generating inaccurate forecasts. This finding has been corroborated by interviews with forecasters (Flyvbjerg & Cowi, 2004; Wachs, 1990). Psychological and political-economic explanations better account for inaccurate forecasts. Psychological explanations account for inaccuracy in terms of optimism bias, that is, a cognitive predisposition found with most people to judge future events in a more positive light than is warranted by actual experience. Political-economic explanations, however, explain inaccuracy in terms of strategic misrepresentation. Here, when forecasting the outcomes of projects, forecasters and planners deliberately and strategically overestimate benefits and underestimate costs in order to increase the likelihood that it is their projects, and not the competition’s, that gain approval and funding. Strategic misrepresentation can be traced to political and organizational pressures, for instance competition for scarce funds or jockeying for position, and to lack of incentive alignment. Optimism bias and strategic misrepresentation are both deception, but where the latter is intentional, the first is not, optimism bias is self-deception. Although the two types of explanation are different, the result is the same: inaccurate forecasts and inflated benefit-cost ratios. However, the cures to optimism bias are different from the cures to strategic misrepresentation, as will be shown later. Explanations of inaccuracy in terms of optimism bias have been developed by Kahneman and Tversky (1979a) and Lovallo and Kahneman (2003). Explanations in terms of strategic misrepresentation have been set forth by Wachs (1989, 1990) and Flyvbjerg et al. (2002, 2005). As illustrated schematically in Figure 1, explanations in terms of optimism bias have their relative merit in situations where political and organizational pressures are absent or low, whereas such explanations hold less power in situations where political pressures are high. Conversely, explanations in terms of strategic misrepresentation have their relative merit where political and organizational pressures are high—this being the situation for the projects described in Flyvbjerg et al. (2002, 2005)—while they become immaterial when such pressures are not present. Thus, rather than compete, the two types of explanation complement each other: one is strong where the other is weak, and both explanations are necessary to understand the phenomenon at hand—the pervasiveness of inaccuracy and risk in decision-making—and how to curb it. In what follows a forecasting method called “reference class forecasting” is presented, which bypasses human bias—including optimism bias and strategic misrepresentation— by cutting directly to outcomes. In experimental research carried out by Daniel Kahneman and others, this method has been demonstrated to be more accurate than conventional forecasting methods (Kahneman & Tversky, 1979a, 1979b; Kahneman, 1994; Lovallo & Kahneman, 2003). First the theoretical and methodological foundations for reference class forecasting are explained, then the first instance of reference class forecasting in practical policy and planning is presented.

## ER-ALT SOLVES…

### ER-Cost-Benefit Analysis

impact analysis should assess all multi dimensional impacts

Naess 06,

Petter Naess, Aalborg University, Cost-benefit analyses of transportation investments: neither

critical nor realistic, Journal of Critical Realism, Vol. 5, No. 1, 2006, pp. 32-60

Developing a critique of a phenomenon is quite pointless unless we are able to identify at least the outline of a desirable and feasible alternative. Without any constructive alternative, the critique will be ‘like criticizing the power of gravity’.68 When presented to one or more of the points of criticisms raised in this article, proponents of cost-benefit analysis often point to the necessity of having some sort of criteria for choosing between alternatives of action and deciding whether or not to implement a proposed project. I agree in this, and also in the claim of defenders of the method that the criteria should be made explicit to as high an extent as possible instead of being concealed in the minds of the individual planners and decision-makers. However, cost-benefit analysis is not the only way to systematically evaluate and rank projects. Instead, an impact analysis should be carried out, with assessment of all relevant impacts that might be anticipated of the project (including intended, non-intended, direct as well as indirect effects). According to Bhaskar & Danermark, every social event must be understood in terms of [a] material transactions with nature, [b] social interaction between agents, [c] social structure proper, and [d] the stratification of embodied personalities of agents.69 All these categories of impacts should be taken into consideration. Impacts along the first dimension typically include consequences to the physical environment, whereas unwholesome noise and air pollution are examples of impacts belonging to the fourth dimension70. Ramifications in terms of changing location of activities and changing travelling patterns are examples of impacts within category b. Relevant impacts on the social structure proper (category c) might include consequences to the development of the overall transportation system at a regional or national scale, including any path dependencies.71

### ER-Economic Rationality

Reject viewing economics as a question of rational actors—more accurate economic predictions result.

#### **Munro, 95**

[Moira Munro. Homo-Economicus in the City: Towards an Urban Socio-economic Research Agenda. Urban Studies Journal Foundation. DOI: 10.1080/00420989550012267. 12/1/1995]

Just as firms and other institutions are being subjected to scrutiny within the socio-economic framework, so too are other collectivities. Etzioni suggests that individuals should not be viewed as the primary units of decision-making. His argument for incorporating the collective in the analysis is that decisions, processes and outcomes cannot be understood in relation to individuals as atomistic units: decisions of the kind that economists routinely study what people buy, how much they invest, how hard they work and soon largely reflect their society, polity, culture and sub-culture, class, as well as collectivities to which they used to belong, and change s in these all (p. 181).The second element of the argument is that not only are collectivities the prime decision making unit, they may also be able to make more rational decisions than individuals. This of course, contrasts with a view that organisations pejoratively characterised as bureaucracies are less efficient than rational individuals at achieving their goals. It is noted that people might typically belong to many different collectivities, each of which may produce quite different signals and messages. That, and the nature of any collectivities with which the individual identifies, suggests that there will be a great deal of variation in the extent to which individuals, in different circumstances and faced with different types of decision, will be influenced by the collectivities of which they are part, or whether they will effectively be in the situation usually assumed of making the decision independently. Again, there are important research questions to test the strength of these links in different situations. A particularly challenging element of the research agenda concerning collectivities is to understand how the economy, which retains its place at the heart of socio-economic analysis, is embedded in, affected by and exerts influence upon social and political structures. This is described by Etzioni as ‘encapsulated competition’, a term which reflects his emphasis on the ways in which competition within different markets is bounded by the (differentiated) limits set by ‘society’. These bounds are set through three types of factors: normative factors (norms and attitudes), social factors (the strongly socialised links between agents within markets), and governmental factors (which can either be explicitly to enforce or to limit the extent of competition). An important departure from the neo-classical models is to reject the notion of `atomistic’ individuals, competing on an equal basis within markets, and to assume instead that there is typically a power differential between agents. The power can be exercised both internally to the market (i.e. actors’ ability to affect the market), and also externally to the context in which the market is embedded (for instance, through a differential ability to influence government policy).

### ER-Environment

#### Modeling must account for collaborative environmental processes with an epistemology that favors creative exploration over establishing proof- the linear predictions of the aff are a futile effort

Zellner et al 12,

Moira Zellner et al, assistant professor in the Department of Urban Planning and Policy and a research assistant professor in the Institute for Environmental Science and Policy at the University of Illinois at Chicago,

Modeling, learning, and planning together: an application of participatory agent-based modeling to environmental planning, URISA Journal Jan, 2012  Volume 24,  Issue1, 1/01/2012

Our motivation is to find ways to enhance collaborative environmental planning processes with the use of modeling tools that can support learning about the complexity of the socio-ecological system and thus promote innovation of policy. We use a different kind of approach, which follows from an epistemology that privileges creative exploration over establishing proof. Rather than using models to accurately predict future impacts of decisions, we use models as prosthetic thinking devices to support the rapid creation and exploration of scenarios that can lay bare previously hidden interaction effects. Prediction works well for linear systems, where models can be used to perform calculations to estimate a future state of the system, and where the only limitation is data accuracy and availability. With complexity, attempting such projections is a futile effort. Even with accurate data readily available, the interdependence of system parts greatly reduces our ability to predict future states, as a variety of plausible futures may emerge from identical processes. In this case, exploring the range of possibilities and how they can emerge from underlying processes is more supportive of planning for complexity and uncertainty than trying to match history and projecting it into the future in a linear manner (Brown et al. 2005). This exploration approach also aligns well with the inquiry-driven learning processes that often are at play in nonclassroom learning settings (Bell et al. 2009). With an exploratory approach, disparate stakeholders may learn how reliance on a shared aquifer, for example, makes each vulnerable to the level and location of water use by others and how these interactions vary depending on environmental conditions and water-use rules and behavior. Their assumptions and beliefs thus are tested as they explore the interconnections among water users with the natural resource illustrated by the model. With this understanding, they may use the model to inform decisions about water-management strategies and programs, and to brainstorm innovative strategies not previously conceived. With interactive, software-based models, it becomes harder to ignore the fact that models are a part of the planning-activity system, playing a role in mediating the communication of knowledge between participants and in shaping the unfurling of the collaborative process (Kaptelinin 1996).

### ER-Expertism

Democratic deliberation allows citizens to create pragmatic policy solutions that adapt in complex systems leading to policy success

Wagenaar 07

Hendrik Wagenaar, Leiden University, the Netherlands, Officials Harness the Complexities of Neighborhood Decline, Governance, Complexity, and Democratic Participation : How Citizens and Public Officials Harness the Complexities of Neighborhood Decline, The American Review of Public Administration, Feb 2, 2007

By focusing on participatory practices, I want to avoid the reductionist fallacy, common to much political theory, of depicting participatory, deliberative democracy as a particular kind of speaking and listening, a special form of dialogue, that, when governed by the well-known rules of communicative rationality, will result in cooperation where before there was conflict and antagonism. 20 Instead, I conceive of democratic deliberation as practical problem solving in public settings, involving a range of activities (exhorting, demonstrating, acquiring funding, drawing up a budget, composing a map or constructing a model, arguing, mediating, hanging out together, in addition to discussing and listening) and actors (citizens, experts, elected officials, professionals) that are governed by principles of openness, mutuality, persuasion by good arguments (but an argument can be a model of a building or an impassioned presentation by an expert), equal access, and lack of deceit. 21 Following the purpose of this article, I will see these practices as contributing to harnessing complexity. That is, I will describe the process of citizen involvement in local governance as consisting of various strategies for dealing with the challenges of the neighborhood as a complex system. In particular, I hope to show that these participatory, deliberative practices are well suited to deal with two core aspects of complexity: novelty and dispersed control. Novelty refers, as we saw, to the intrinsic indeterminacy, the “endlessly unfolding surprise” and the concomitant absence of a one best solution, which is so central in complexity theory (Waldrop, 1992, p. 165). Dispersed control follows from the density of interactions and the resultant indeterminacy of effect. One or more actors in the system may claim central control (as usually happens in policy networks), but that does not necessarily mean that they are able to actually assert it. In fact, in the case of wicked problems, the rule is stalemate, controversy, suprise, strategic behavior, and unintended consequences, as opposed to the exception of arriving at the stated policy goals in more or less the indicated time frame. Democratic deliberation from this perspective is a joint exploration into the “space of infinite possibilities” to discover improvements of the current situation instead of the stated goal or the optimal solution; a collective activity in which, when it goes well, the journey is as important as the result. So what democratic practices did I identify in the participatory arrangements I studied? What does the process of local democratic governance look like “on the ground”? Based on my interviews with citizens, politicians, administrators, and professionals such as social workers or officials of housing corporations, I found three distinct practices that I have called “pragmatism,” “an integrated approach to problem solving,” and “creating and maintaining a democratic communicative space.” 22 Pragmatism Citizen initiatives in neighborhoods generally originate in the confrontation of residents with unresolved concrete problems. As one of the citizens said with some irony: “Uncollected garbage is the force that binds us.” It comes as no surprise then that citizens approach these problems with considerable pragmatism. What counts is that the problem is solved effectively and without delay. What is perhaps more surprising is that, despite this practical orientation, citizens usually do not lose sight of the many ways that the problem interacts with other problems or with elements of the larger context. 23 In fact, I consider this nonreductionist way of dealing with practical problems as one of the most important findings of the study. Over and over again, citizens demonstrated that a focus on practical problem solving went hand in hand with an awareness of the permanence of the problems in their neighborhood. On-the-ground problems are not solved merely by formulating a policy. With the term pragmatism, I denote therefore a way of dealing with issues in which concreteness and a continuous awareness of complexity go hand in hand.

### ER-Sustainability

#### The alternative’s incorporation of uncertainty into policy analysis solve sustainable transport systems

Caruso and Kern, 04

[Anthony Caruso and Florian Kern. ‘Transition Management’ in Developing a More Sustainable Transportation System.’ Roskilde University Center. May 24, 2004]

As demonstrated, there are a variety of reasons for the failure of current policy approaches¶ to lead towards sustainability, but one of the most important factors is that a lot of the¶ negative impacts are due to inherent characteristics of the existing transportation system¶ and can therefore not be solved within the system. The challenge is to create a¶ transportation system that is inherently more environmentally benign. The difficult¶ question is how such a shift in perspective can be reached and what the role of policy in¶ such a process would be? Is it possible to change an existing system in a non-disruptive¶ way, at low transition costs? Systems are not easy to change due to the mentioned path¶ dependencies, uncertainties, complexity and vested interests. Uncertainty is arguably the¶ most interesting barrier to system innovations, because the identification of this barrier¶ reflects a change in policy thinking (Kemp and Loorbach 2003: 4-5).¶ According to Jänicke and Jörgens four aspects of uncertainty can be distinguished: the¶ uncertainty of prognosis about environmental changes and negative impacts, political¶ uncertainty about the need for action regarding long-term problems which are still invisible¶ to the general public, uncertainty about the environmental, social and economic¶ consequences of policy decisions and non-decisions and uncertainty of environmental¶ pioneers about the chances and risks of innovative behaviour. The uncertainties are not¶ enough reflected in the current policy approaches and strategic environmental policy¶ planning is presented as one way of dealing with the uncertainties (Jänicke and Jörgens¶ 1999: 176). This new and more comprehensive approach was a result of the Rio¶ Conference and is characterised by¶ the emphasis placed on setting long-term goals on a broad political and¶ societal basis, the integration of environmental objectives into other policy¶ areas (inter-sectoral integration), a co-operative target group policy and the¶ mobilization of additional decentralized societal capacities (ibid: 177).¶ This kind of environmental planning is not just another instrument of environmental¶ policy, but a comprehensive strategy, which entails a permanent process of learning, setting goals, formulating and implementing measures. The Netherlands can be seen as one¶ of the successful pioneers and have been setting the pace in global environmental policy¶ learning in this respect (ibid: 179). The 4th Dutch National Environmental Policy Plan¶ (NEPP 4) as the latest policy document of this kind employs a retrospective from the last¶ 30 years of environmental policy and concludes that “current policies do not adequately¶ take into account the obstacles to sustainable development, which can be regarded as¶ system faults in the economy and institutions now functioning” (Ministry of Housing,¶ Spatial Planning and the Environment 2001).5¶ What would such a new approach, one that takes into account the obstacles and accepted¶ them as a starting point, look like? Referring to ‘Transition Management’ Grosskurth and¶ Rotmans state*,¶* Any approach should as an end result not only highlight the driving forces of¶ sustainable development, but also serve the levers available to influence the system in¶ co-operation with those who handle these levers. Otherwise any approach will¶ remain of academic interest only and not do justice to the concept of sustainability at¶ the interface of science and politics (2002: 7-8). The problems related to becoming more sustainable can no longer be addressed with just¶ one perspective. A new governance approach is needed to steer the current system into a¶ more sustainable direction. To date, societal advances and improvements have made some¶ difference in making transportation systems more sustainable, but there still remains much¶ more to do. Policy-makers, politicians and planners are up against some major hurdles in¶ attempting to reach such an ambitious goals and the need for a new approach to do this is¶ paramount. ‘Transition Management’ is one such approach. It tries to fill the current gaps¶ in knowledge and to address some of the fundamental problems societies have in bringing¶ about more sustainable transportation systems.

## ER-AT to AT

### ER-AT Rational Actor not Intrinsic to Aff

#### Even if their economy advantage doesn’t explicitly isolate economic theories of rational actors, attempts to control flows of mobility inherently rely on this model turning case.

Caruso and Kern, 04

[Anthony Caruso and Florian Kern. ‘Transition Management’ in Developing a More Sustainable Transportation System.’ Roskilde University Center. May 24, 2004]

Transport is not a basic need as such, but has been traditionally seen as a derived demand.¶ People need to obtain food, get to work, go to university or go to the bank, all of which involves transport. However, studies suggest that traffic is not merely a derived demand,¶ but that travel demand is highly influenced by people’s subjective attitudes towards travel¶ (Mokhtatian, Salomon and Redmond 2001: 355). This holds true not only for recreational¶ activities but also for more mandatory purposes such as work-related travels. Mokhtatian,¶ Salomon and Redmond do not deny that most travel is utilitarian or purposive but they¶ contest the dominating paradigm by arguing that traffic has “an intrinsic positive utility¶ and is valued for its own sake” (ibid: 355). The extent varies by person, travel mode,¶ purpose and circumstances and is therefore unevenly distributed among the population;¶ however, policy and planning should take this facet into account. How can traditional¶ policy approaches incorporate such findings? This aspect of irrationality in travel¶ behaviour, namely that transport does not always follow cost-benefit criteria but basic¶ instincts or psychologically induced needs, makes it difficult for policy makers and¶ planners to influence traffic flows. All the models and suggestions for efficient economic¶ instruments are based on the assumption that human beings are rational and change their¶ behaviour according to changing price signals. ‘Getting the prices right’ under those¶ circumstances seems not to be the easy answer.

### ER-AT Alt = Elitist

#### Status quo simulation models rely on computers that are inaccessible—complexity’s reliance on agent-based modeling leads to participatory research.

Zellner et al 12,

Moira Zellner et al, assistant professor in the Department of Urban Planning and Policy and a research assistant professor in the Institute for Environmental Science and Policy at the University of Illinois at Chicago,

Modeling, learning, and planning together: an application of participatory agent-based modeling to environmental planning, URISA Journal Jan, 2012  Volume 24,  Issue1, 1/01/2012

County and regional government agencies use stakeholder committees to ensure representation of diverse interests when planning, but these representatives often are not trained to understand the complexity inherent to human-environmental issues (e.g., groundwater management). Planning professionals use computer models to simulate the interaction effects of different plan-related policies, but most are "black boxes" to stakeholders, who, therefore, are forced to trust the simulations without understanding human-environmental complexity, reducing the opportunities for effective solution building. Agent-based models can represent decisions and environmental dynamics in a rule-based form that invites nonexpert users' involvement in both developing the model and meaningfully interpreting its outputs. We conducted a series of collaborative and developmental agent-based modeling meetings with stakeholders and planners in a rapidly suburbanizing area facing groundwater shortages. Stakeholders learned how to use the models, understand the relationships among the components, interpret the outputs based on these relationships, and suggested modifications with new insights. The enhanced understanding of complex interactions reduced early commitments to policy solutions as stakeholders jointly explored the range of possible outcomes. These results show that agent- based modeling holds promise for use in collaborative planning exercises.

### ER-AT Link Turn

#### Even if your predictions assume individual agency they don’t account for dynamic adaptive systems

Dodder, 2000

[Rebecca Dodder, Technology and Policy Program MIT, The Evolving Systems View of Transportation, Implications for Policy, December 2000]

While models such as the gravity model continue to provide valid and useful insights, the  modeling of the demand for transportation services has progressed along several dimensions.  First, as noted above, operators, including private automobile drivers, are now incorporated as  internal components of the transportation system, whose behavior and decisions help determine  the state of the system, rather than remaining as simply users of the system. Second, demand  models have been increasingly disaggregated, as analysts develop more sophisticated  understandings of user behavior. Third, the demand is understood to possess both a systematic  and a random component of choice, thereby explicitly introducing demand stochasticity into the  model. All of these trends have been developed within the set of models known as discrete  choice analysis, which began to take shape in the 1970s.Defining the Transportation System 8  THE EVOLVING SYSTEMS VIEW OF TRANSPORTATION  In addition to the modeling advances associated with the disaggregation of the factors that  generate demand for trips, models have also progressed from macroscopic simulations of traffic  flows, to microscopic models that take into account the behavior of individual drivers and their  interactions while on the network. As an indicator of this analytical shift from flows of vehicles  to flows of individuals, one can point to changes in urban transportation planning. In the late  1960s, traffic engineers developed the concept of the exclusive bus lane. While this was driven  by intensifying traffic congestion, and later by issues of air quality and energy use, Altshuler  contends that “the bus lane represented a major turning points in the history of traffic  engineering…. Now highway officials began to adopt the position that…the unit of analysis  should be the person…[with] the aim of improved person flow” (Altshuler, 1981).

Taken together, these modeling advances have enabled analysts to move from a predominantly  static to a more dynamic treatment of transportation systems. As will be discussed later, the next  major step from static to more realistic dynamic models is to begin formulating models of  adaptive systems. In this respect, it is important to note that the first of “30 Key Points” in  Sussman (2000) states that: “People and organizations alter behavior based on transportation  service expectations.”  Building Systems  Closely intertwined with the methods and assumptions used for modeling the system, are the  processes and steps by which the transportation system is designed and planned? In particular,  how are alternative systems designs developed, and what are the variables and options available  for changing existing systems or creating new systems. In this respect, it is also illustrative to  question: who are the “system builders  5  , and what role to they play?”  Beginning in the late 1960s, many analysts were arguing for the expanded utilization of the  systems analysis framework for the urban transportation planning process (Catanese, 1972).

### ER-AT Try or Die/Timeframe Distinction

Focus on immediate impacts causes policy failure in the transportation context—policy deliberation must expand the scope.

Willson et al 08

[Richard W. Willson, Marianne Payne, and Ellen Smith; Willson is Interim Dean in the College¶ of Environmental Design at California State Polytechnic University Pomona, Payne directs strategic¶ planning at the Bay Area Rapid Transit District¶ (BART); Smith manages BART’s planning in Contra Costa County; “Does Discussion Enhance Rationality? A Report from

Transportation Planning Practice”; Journal of the American Planning Association, 69:4, 354-367]

2. The communicative rationality approach improved¶ issue framing through the simultaneous consideration¶ of means and ends. Sometimes transportation plans develop consensual goals early on, but the goals do not significantly shape the policy choices. They are either vague or not meaningfully connected to strategy. Strategies are then debated with unresolved goal differences in the background. A communicative rationality approach seeks robust connections between ends and means and recognizes that connections occur in a recursive process, not a mechanistic optimization. This process makes issue frames—the paradigmatic structures¶ that shape understanding and imply strategies—visible¶ and changeable.¶ The BART process had this interplay between ends¶ and means. Directors offered different issue frames¶ (embedded with ends and means preferences) in freeranging¶ discussions. The narrative created frames that¶ shaped the understanding of the problem and implied¶ goals and strategies for action. In Workshop 1, the discussion¶ mixed arguments for particular policies with¶ broader issue frames and implied goals. In the midst of¶ heated exchanges, having a formal discussion about ends¶ would not have been useful.¶ Figure 5 offers an example of alternative issue frames.¶ The dialogue concerning these issue frames revealed the¶ alternative conceptions of BART’s mission, and it relied¶ on rhetoric, not data. It involved a series of issue frame¶ “offers” as directors sought agreement with their conceptualization.¶ Some frames were taken up by other directors;¶ others did not gain support. Collectively, directors¶ judged the validity of the claims as they sought a¶ workable basis for proceeding. Because the Board was so¶ evenly split, neither side had sufficient power to impose¶ an issue frame or distort the interaction to legitimize a¶ predetermined outcome.¶ The entire scope of the policy problem was reframed¶ toward the end of the process. Initially conceived as a¶ parking policy, the project was redefined as an access policy¶ in the second-to-last Board review. This broadening¶ brought in issues of access by bicycle, transit, and the¶ like. It allowed Board members to understand how their¶ differing interests might be accommodated. Because it¶ substantially broadened the scope of the policy, this¶ change required subsequent evaluations of access improvements¶ in station-level access planning processes.¶ Expanding the scope brought about a more robust,¶ albeit more general, consensus. The policy required early¶ action on consensual strategies (means such as altering¶ parking time limits) and a more locally based approach¶ for other strategies. A station- or corridor-specific implementation¶ process allowed for differences in intermediate-¶ level ends and created additional learning¶ opportunities.¶ Issue framing and the simultaneous consideration¶ of means and ends complicated the analytic tasks. All¶ discussions had implications for transit system ridership,¶ revenues and costs, equity, customer satisfaction,¶ joint development at transit stations, and other critical¶ issues. BART’s analytic processes were challenged in responding¶ to “what if” questions that were analytically¶ complex. BART was fortunate to have a station access¶ database with information on parking use levels, ridership,¶ and other key factors. Knowing what time each lot¶ filled, for example, gave a sense of the latent demand¶ should parking prices discourage some riders from using¶ BART. However, more complex questions, such as those¶ concerning the interplay of parking charges, ridership¶ (by time of day), station selection, system capacity, and¶ fare revenue were difficult to address. The pace of policy discussion only allowed for analytic approaches based on existing data and estimates; altering the process to collect new data or create a new modeling capability would have altered the flow of policy conversation and introduced rigidity and delays. The danger in this approach, of course, is reaching consensus on an approach that has technical flaws that would only be revealed by detailed modeling and evaluation. Using quick-response modeling, therefore, may not be appropriate for final decisions on capital-intensive projects that are irreversible.¶ In sum, the simultaneous consideration of means¶ and ends allowed for a serious engagement of issue¶ frames that enriched the discussion and learning. It contributed to a reframing of the issues on multiple levels, furthered understanding of the terrain of differences, and resulted in an incremental, experimental policy approach. It helped the Board move toward solving the realproblems, rather than their first impressions of what the problems were.

### ER-AT We’re Uncertain/Recognize Bias

#### Even if they are aware of this cognitive bias it still causes them to over-estimate risk.

Flyvbjerg 8

[Bent Flyvbjerg, Aalborg University, Denmark and Delft University of Technology, “Curbing Optimism Bias and Strategic Misrepresentation in Planning: Reference Class Forecasting in Practice”, European Planning Studies Vol. 16, No. 1, January 2008]

The Planning Fallacy and Reference Class Forecasting The theoretical and methodological foundations of reference class forecasting were first described by Kahneman and Tversky (1979b) and later by Lovallo and Kahneman (2003). Reference class forecasting was originally developed to compensate for the type of cognitive bias that Kahneman and Tversky found in their work on decision-making under uncertainty, which won Kahneman the Nobel prize in economics 2002 (Kahneman, 1994; Kahneman & Tversky, 1979a). This work shows that errors of judgment are often systematic and predictable rather than random, manifesting bias rather than confusion, and that any corrective prescription should reflect this. It also shows that many errors of judgment are shared by experts and laypeople alike. Finally the work demonstrates that errors remain compelling even when one is fully aware of their nature. Thus awareness of a perceptual or cognitive illusion does not by itself produce a more accurate perception of reality, according to Kahneman and Tversky (1979b, p. 314). Awareness may, however, enable one to identify situations in which the normal faith in one’s impressions must be suspended and in which judgment should be controlled by a more critical evaluation of the evidence. Reference class forecasting is a method for such critical evaluation. Human judgment, including forecasts, is biased. Reference class forecasting is a method for debiasing forecasts. Kahneman and Tversky (1979a, 1979b) demonstrate that human judgment is generally optimistic due to overconfidence and insufficient regard to distributional information. Thus people will underestimate the costs, completion times, and risks of planned actions, whereas they will overestimate the benefits of the same actions. Following and expanding upon Buehler et al. (1994), Lovallo and Kahneman (2003, p. 58) call such common behaviour the “planning fallacy” and they argue that it stems from actors taking an “inside view” focusing on the constituents of the specific planned action rather than on the outcomes of similar actions that have already been completed. At the root of the planning fallacy is a tendency for actors to see each new venture as unique. In fact, ventures are typically more similar than actors assume, even ventures that on the surface of things may appear entirely different. For instance, planners may consider building a subway and building an opera house to be completely different undertakings with little to gain from each other. In fact the two may be—and often are—quite similar in statistical terms, for example as regards the size of cost overruns. And the lessons from one can be pooled with other similar projects and used as distributional information to statistically predict the outcome of the other. Kahneman and Tversky (1979b) argue that the prevalent tendency to underweigh or ignore distributional information is perhaps the major source of error in forecasting. “The analysts should therefore make every effort to frame the forecasting problem so as to facilitate utilizing all the distributional information that is available” (Kahneman & Tversky, 1979b, p. 316). This may be considered the single most important piece of advice regarding how to increase accuracy in forecasting through improved methods. Using such distributional information from other ventures similar to that being forecasted is called taking an “outside view” and it is the cure to the planning fallacy. Reference class forecasting is a method for systematically taking an outside view on planned actions. More specifically, reference class forecasting for a particular project requires the following three steps: (1) Identification of a relevant reference class of past, similar projects. The class must be broad enough to be statistically meaningful but narrow enough to be truly comparable with the specific project. (2) Establishing a probability distribution for the selected reference class. This requires access to credible, empirical data for a sufficient number of projects within the reference class to make statistically meaningful conclusions. (3) Comparing the specific project with the reference class distribution, in order to establish the most likely outcome for the specific project.

### ER-AT Perm

#### Perm doesn’t solve- reforming flawed cost benefit criteria leads to minor improvements at best- the entire lens is a reductionist approach

Naess 06,

Petter Naess, Aalborg University, Cost-benefit analyses of transportation investments: neither

critical nor realistic, Journal of Critical Realism, Vol. 5, No. 1, 2006, pp. 32-60

Above, a number of problems associated with the quantification and economic valuation of important impact categories of transportation investment project were discussed. Among cost-benefit analysts, two different ways of reacting to this are common: Reducing the analysis to the impact categories that most easily lend themselves to economic valuation, or refine the assessment and valuation methods in order to measure the ‘intangible’ impacts in a better way. However, since the low validity and reliability of the present ways of trying to put price tags on these impacts is rooted in ontological misconceptions, improving the surveying methods e.g. in willingness-to-pay investigations can hardly do more than marginal improvements. (It would be like correcting the wrong digits to the right of the comma while leaving the digits to the left of the comma uncorrected.) Reducing the analysis to the ontologically and epistemologically least problematic categories therefore seems to be a better option. But what will then be left of the analysis? As mentioned above, time savings often make up the main benefit category in cost-benefit analyses of transport infrastructure projects. However, the assessment of the magnitude of these savings as well as the valuation of these savings in monetary terms is highly uncertain and controversial. In some cases (e.g. bypass roads) safety improvements are also important parts of the motivation for the projects. However, as mentioned earlier, uncertainty and controversy is attached both to the assessment of the influence of the project on the number of deaths, injuries and other damages, and to the economic valuation of these impacts. On the cost side, the mere construction cost should, in principle, be possible to estimate relatively accurately (although what happens in practice is often serious underestimation of costs).67 However, since the economic valuation of nearly all the other items of the analysis, both on the benefit and cost side, is encumbered with uncertainty and contestation, it is difficult to avoid the conclusion that the entire method of cost-benefit analysis is inappropriate for the evaluation and comparison of transportation investment projects.

### ER-AT Case Outweighs

#### Even if the AFF wins some risk their predictions are roughly accurate- they create a “lock in” effect that makes the impacts inevitable

Dodder, 2000

[Rebecca Dodder, Technology and Policy Program MIT, The Evolving Systems View of Transportation, Implications for Policy, December 2000]

This approach promised a more systematic and rational approach, “with assumptions made  explicit, objectives and criteria clearly defined, and alternative courses of action compared in the  light of their possible consequences” (Catanese, 1972). Although the process was recognized to  be an iterative process, the basic approach entailed six stages: 1) problem formulation, 2) system  structure, 3) quantitative approach, 4) development of alternatives, 5) evaluation of alternatives,  and 6) interpretation. What will be argued here, is that the first three stages, which are related to  way in which the system is defined and modeled, to a large extent, determine the alternatives that  are developed.  Forecasting and Planning  For the purposes of planning for investment in urban transportation, network flows have  typically been projected as following well-specified patterns, usually with the forecast output  matching existing statistical behavior for trip demand. The demand for urban transportation has  been seen as roughly predictable enough to be forecast ten to twenty years into the future, so that  urban transportation improvements could be undertaken in order to satisfy that future demand.  These assumptions were in fact necessary, especially given the lumpy nature of investment in  capacity expansion. Furthermore, the models relied heavily upon assumptions of travel market equilibrium between the volume of services demanded and provided. These assumptions of both  a certain degree of predictability and linearity, while useful for such long-term planning as  infrastructure investments, also have the effect of locking in a systems to a particular trajectory  of development, and limiting less conventional planning options.

### ER-AT Policymaking Good

#### Understanding systems key to policy making

Dodder, 2000

[Rebecca Dodder, Technology and Policy Program MIT, The Evolving Systems View of Transportation, Implications for Policy, December 2000]

Crafting Policies

The systems view used in defining, modeling, planning and designing transportation systems,  ultimately has a powerful impact on the policy making process. It not only frames the evaluation  of the system - excluding certain factors as external to the system and highlighting some cause effect relationships and at the expense of others - but also alters the process by which a final  decision is reached with regard to one policy option or another.

Changing system evaluation

The definition of the system’s boundaries and components, the nature of its interaction with  systems outside of those boundaries, and the internal dynamics between components, are critical  to policymaking. The systems definition can determine what sets of attributes are used to  evaluate the system. As the system’s view of the urban transportation system has changed, there  has also been an expanded set of evaluative criteria for determining the ‘performance’ of the  system. Whereas earlier, technical criteria and cost considerations were the dominant concerns,  and therefore relatively easily dealt with using a systems analysis framework, as described above  by Catanese (1972), in the post-WWII period a host of other concerns have become critical  determinates of a system’s perceived success or performance. For example, issues of  environmental impacts, particularly air quality; preservation of ethnic, historic and neighborhood  identity; safety; employment and job access; equity; and aesthetics have made the evaluation of  systems incredibly complex.

# Advantage Links

## Link-Geopolitics-1

**Applying linear models to internal relations fails because of interlocking open systems with unpredictable actors**

**Hendrick, 2009** – PhD in Conflict Resolution from Bradford University, contributor to the Oxford University Press (Diane, “Complexity Theory and Conflict Transformation: An Exploration of Potential and Implications”, <http://www.brad.ac.uk/acad/confres/papers/pdfs/CCR17.pdf>)//BZ

In international relations Neil E. Harrison makes the case for the value of complexity theory given the unpredictability of events in world politics that has confounded expectations based on existing theories. While there are various explanations proffered for this situation, Harrison sees the tendency of current theories of world politics to work with models of the social world that present it, for analytical purposes, as a simple system as fundamentally misleading. In contrast to realism, that sees political behaviour being driven by essential human characteristics within fixed structures, complexity theory sees world politics as a self- organising complex system in which macroproperties emerge from microinteractions. It is precisely the interactions among interdependent but individual agents within the system that account for the surprising events that defy prediction through the simple models used at the moment. Harrison thus takes the state as a system that is not closed but open to other natural and social systems: “defined as a political system, it is open to technological, cultural and economic systems that influence political choices and processes.” (Harrison, 2006 p. 8) The state is also influenced by other states and by numerous transboundary interactions between major corporations, NGOs, terrorist groups, etc. In such complex systems it is not possible to trace linear causal links: “Despite occasional attempts to bring in domestic politics the state is usually modelled as a unit with exogenous identity and objective interests. This greatly reduces the range of possible causal explanations for any perceived social event, simplifying causal analysis and hypothesis generation and testing.” (Harrison, 2006 p. 11) It is a disconcerting fact that outcomes may have multiple causes and that in different contexts, historically or spatially, the same cause may lead to different outcomes. This cannot be captured by the over-simplified models of international systems. Given the multiple, mutually influencing interactions within social systems it is necessary to look to the evolution of the system rather than to individual events when seeking the causes of observed effects. Complexity theory focuses on processes and relations between components, or in the case of social systems, agents, rather than the components themselves. In a similar criticism to that of Walby, Harrison points to the tendency of theories in international relations to focus on one level of analysis and to present competing theories based on these. Where systems are theorised, they are limited by being presented as nested. Harrison notes that the impact of positive feedback in systems has been acknowledged: “ ‘(I)ntra-national and inter-national events all impinge on one another in a cyclical and ongoing process within which the self-aggravating propensities frequently exceed the self-correcting ones by an unacceptably large amount’ (Singer 1970, 165) thus national elites use rhetoric for domestic political consumption that can incite potential enemies, the public and military desire the psychological comfort of discernible superiority, media amplify inter-nation conflicts, and the benefits of participation in the ideological mainstream preserve the distribution of power and inhibit changes in the historic patterns that transform inevitable conflicts into costly rivalries.” (Harrison, 2006 p. 28) While Walby refers to examples of the importance of the notion of path dependence with reference to differences in development between countries, Harrison sees its relevance at the level of the international state system. Thus development through time is not wholly random and there are limits or constraints created by the prior development of the system that restrict the possible options for change. In this way the international system may change its structure without becoming another system and here Harrison brings the example of the Cold War. While it is true that the Cold War was produced by historical interactions, it is still not possible to claim that it was an inevitable effect of historical causes. The myriad microinteractions that occurred introduce unpredictability into development, especially given the above-mentioned possibility of positive feedback. Harrison is optimistic with regard to the gains from the application of complexity theory to world politics in theoretical but also in policy terms: “This ontological shift from simple to complex systems opens new paths to knowledge and understanding yet incorporates much current knowledge; it validates novel research methods; and theories founded in this approach will generate radically different solutions to policy problems.” (Harrison, 2006 p. 2)

## Link-Geopolitics-2

**Long term predictions are ludicrous as too many actors over a long period of time cannot be linearized. Complexity theory anticipating short term predictions is necessary for international relations.**

**Kissane, 2007** – assistant dean at the Centre d'Etudes Franco-Americain de Management, lecturer at the University of South Australia, PhD from the University of South Australia in International Relations theory (Dylan, “The possibility for theoretical revolution in international politics”, <http://works.bepress.com/dylankissane/16)//BZ>

From these three assumptions - chaos, security seeking and interaction - can be extracted a series of predictions about the international system. Drawing on the first assumption, it becomes clear that long-term prediction of the system is impossible, but that short-term predictions and even medium-term predictions are likely to be accurate (Gleick 1987,18). This is generally due to the fact that very small irregularities and unmeasured impacts within the system feedback into the system producing larger and larger change over time (Jervis 1997, Chapter Four). The 'butterfly effect', which is described as the possibility that the flutter of a butterfly’s wings in Beijing can cause a hurricane in Florida, is an example of such feedback. Indeed, in the weather we have a chaotic system that is largely predictable short term (for example, the chance of rain in the morning), somewhat predictable in the medium term (for example, it is likely to be sunny next weekend) but almost entirely unpredictable long-term (for example, it will be 32°C on December 21st 2009). The cumulative effect of 'butterfly-level' events conspire to defeat even the most advanced weather model, leaving meteorologists without much of a long-term prediction other than summer will be warmer than winter (Young 2002). Of course, the weather also provides us with an example of 'butterfly-level' events that do not feedback into the system. That is, while a butterfly may have an impact on the wider system, it can also not have an impact (Kissane 2006, 95). If every event in the system affected the entire system, prediction would likely be impossible. So while prediction long-term is impossible or, at the least, unlikely, there remains the possibility and reality that chaotic systems can be predicted in the short and medium term. The meaning of security is self-constructed but socially effected Drawing on the latter two assumptions, as security is an actor-constructed notion, variation in definition is likely when comparing actors. However, as actors are 'social' - that is, they interact - there are also likely to be some regularity in definition between actors of a similar type. The ability of actors to construct their own notion of what security is allows for variation between actors in that definition. Thus, it is likely that some actors will define security in military terms, some in economic terms and some in terms of simple survival (Bellamy and McDonald 2004). These differences in the definition of security may reflect differentials in power, status or culture; whatever the reason for the difference in definition, the most basic underlying explanation is that the actor has constructed its own definition of security. Thus, it would not be unusual for some state actors, for example, to seek security by banding together and pooling sovereignty (for example, in the EU) and others to attempt to become more fully independent (for example, Iran) (Smith 2000, 33). However, as it is also assumed that actors interact, it is assumed that there will be some processes of socialisation evident in the interactions. Thus, we would expect that there would be some similarities emergent among certain types of actors that are common to all (or almost all) other actors of that type. Thus, for nation-states we might find that almost all will attempt to increase security through the maintenance an armed defence force; for multinational corporations (MNCs) we might find that almost all attempt to increase security through increased economic profitability; for NGOs we might find that almost all are of a ‘progressive’ political nature (assumed to be better for survival in the system, as they understand it).

## Link-Geopolitics-3

**Scenario planning on international conflicts fails –miscalculation and war**

**Jervis, 97** – professor of international affairs at Columbia (Robert, “Complex Systems: The Role of Interactions”, Complexity, Global Politics, and National Security, <http://www.dodccrp.org/html4/bibliography/comch03.html>) //BZ

Because actions change the environment in which they operate, identical but later behavior does not produce identical results: history is about the changes produced by previous thought and action as people and organizations confront each other through time. The final crisis leading to World War II provides an illustration of some of these processes. Hitler had witnessed his adversaries give in to pressure; as he explained, "Our enemies are little worms. I saw them at Munich."21 But the allies had changed because of Hitler’s behavior. So had Poland. As A.J.P. Taylor puts it, "Munich cast a long shadow. Hitler waited for it to happen again; Beck took warning from the fate of Benes."22 Hitler was not the only leader to fail to understand that his behavior would change his environment. Like good linear social scientists, many statesmen see that their actions can produce a desired outcome, all other things being equal, and project into the future the maintenance of the conditions that their behavior will in fact undermine. This in part explains the Argentine calculations preceding the seizure of the Falklands/Malvinas. Their leaders could see that Britain’s ability to protect its position was waning, as evinced by the declining naval presence, and that Argentina’s claim to the islands had received widespread international support. But what they neglected was the likelihood that the invasion would alter these facts, unifying British opinion against accepting humiliation and changing the issue for international audiences from the illegitimacy of colonialism to the illegitimacy of the use of force. A similar neglect of the transformative power of action may explain why Saddam Hussein thought he could conquer Kuwait. Even if America wanted to intervene, it could do so only with the support and cooperation of other Arab countries, which had sympathized with Iraq’s claims and urged American restraint. But the invasion of Kuwait drastically increased the Arabs’ perception of threat and so altered their stance. Furthermore, their willingness to give credence to Iraqi promises was destroyed by the deception that had enabled the invasion to take everyone by surprise. Germany’s miscalculation in 1917 was based on a related error: although unrestricted submarine warfare succeeded in sinking more British shipping than the Germans had estimated would be required to drive Britain from the war, the American entry (which Germany expected) led the British to tolerate shortages that otherwise would have broken their will because they knew that if they held out, the U.S. would rescue them.23 The failure to appreciate the fact that the behavior of the actors is in part responsible for the environment which then impinges on them can lead observers—and actors as well—to underestimate actors’ influence. Thus states caught in a conflict spiral believe that they have little choice but to respond in kind to the adversary’s hostility. This may be true, but it may have been the states’ earlier behavior that generated the situation that now is compelling. Robert McNamara complains about how he was mislead by faulty military reporting but similarly fails to consider whether his style and pressure might have contributed to what he was being told.24 Products of Interaction as the Unit of Analysis Interaction can be so intense and transformative that we can no longer fruitfully distinguish between actors and their environments, let alone say much about any element in isolation. We are accustomed to referring to roads as safe or dangerous, but if the drivers understand the road conditions this formulation may be misleading: the knowledge that, driving habits held constant, one stretch is safe or dangerous will affect how people drive—they are likely to slow down and be more careful when they think the road is dangerous and speed up and let their attention wander when it is "safe." It is then the road-driver system that is the most meaningful unit of analysis. In the wake of the sinking of a roll-on roll-off ferry, an industry representative said: With roro’s, the basic problem is that you have a huge open car deck with doors at each end. But people are well aware of this, and it is taken into account in design and operation. You don’t mess around with them. There have not been too many accidents because they are operated with such care.25 Similarly, we often refer to international situations as precarious, unstable, or dangerous. But, again, if statesmen perceive them as such and fear the consequences, they will act to reduce the danger—one reason why the Cuban missile crisis did not lead to war was that both sides felt that this could be the outcome if they were not very careful. Nuclear weapons generally have this effect. Because statesmen dread all-out war, international politics is safer than it would otherwise be, and probably safer than if war were less destructive. Conversely, like drivers on a "safe" stretch of road, decision-makers can behave more recklessly in calmer times because they have more freedom to seek unilateral gains as well as needing to generate risk to put pressure on others. For example, the relaxation of Anglo-German tensions after 1911 may have misled both countries into believing that they could afford dangerous tactics in 1914. Circular Effects Systems can produce circular effects as actors respond to the new environments their actions have created, often changing themselves in the process. In international politics, perhaps the most important manifestation of this dynamic is the large-scale operation of the security dilemma—i.e., the tendency for efforts to increase a state’s security to simultaneously decrease the security of others. Because states know that they cannot rely on others in the unpredictable future, they seek to protect themselves against a wide range of menaces. Thus in the 1930s Japan, which was heavily dependent on resources from outside its borders, sought to expand the area it controlled. Immediate economic needs generated by the world-wide depression increased but did not create this impulse. Nor were they brought on by specific conflicts with the Western powers. Rather what was driving was the fear that conflict might be forced upon Japan in the future, which meant that to remain secure Japan needed raw materials and larger markets. The result was the conquest of Manchuria, followed by a larger war with China, and then by the occupation of Indochina. Each move generated resistance that made the next action seem necessary, and the last move triggered the American oil embargo, which in turn pushed Japan into attacking the West before it ran out of oil. Had Japan been secure, her aggression would not have been necessary; it was the fear of an eventual war with the West that required policies that moved Western enmity from a possibility to a reality. (Of course a further irony is that World War II led to the reconstruction of international politics and the Japanese domestic system that brought Japan security, economic dominance of South East Asia, and access to markets around the world.) Despite the familiarity of the idea that social action forms and takes place within a system, scholars and statesmen as well as the general public are prone to think in non-systemic terms. This is often appropriate, and few miracles will follow from thinking systemically because the interactive, strategic, and contingent nature of systems limits the extent to which complete and deterministic theories are possible. But we need to take more seriously the notion that we are in a system and to look for the dynamics that drive them. A distinguished student of genetics summarized his perspective in the phrase: "Nothing in biology makes sense except in the light of evolution."26 Very little in social and political life makes sense except in the light of systemic processes. Exploring them gives us new possibilities for understanding and effective action; in their absence we are likely to flounder.

## Link-Geopolitics-4

**Complexity key to stop escalating conflicts- prevents flashpoints**

**Saperstein, 97** – professor of physics at Wayne State (Alvin, “Complexity, Chaos, and National Security Policy: Metaphors or Tools?, Complexity, Global Politics, and National Security, <http://www.dodccrp.org/html4/bibliography/comch05.html>) //BZ

It is clear that successful military and political policy makers have always entertained the potentiality of chaos and have sought the tools of redundancy and flexibility of resources to deal with that possibility. The only new tool to deal with chaos presented here is the engineering tool of attempting to predict crisis instability and then avoid it or be prepared to live with it. Quantitative dynamical models of the system of interest may be useful in making such predictions. If they are inadequate or unavailable, verbal models have a long history, and potentiality, of use. If the leaders of the pre-WWI European states had recognized that the railroad schedule-dominated mobilization of their troops was a source of great crisis instability (Tuchman 1962, van Creveld 1989), perhaps they would have avoided starting—and being trapped by—the process. But this recognition would have required that the chaos metaphor be more commonly found in the "intellectual air" of turn-of-the-century Europe than was the case in that rapidly industrializing Newtonian-reductionist society. Given a Newtonian paradigm, the policymaker strives to be efficient in reacting to a given "field of endeavor"; chaos is to be avoided or dealt with by overwhelming force and/or redundant means of force delivery. The present world seems to require a Prigoginean outlook: don’t accept the battlefield or the world system as a fixed given. The complexity, or adaptive self-organizing, metaphor should be very useful for the necessary education, recruitment, planning, and thinking required to deal with and survive our future. However, no obvious specific tool—like predicting crisis instability—comes to mind. The metaphor require that one should always be contemplating the future. And, among these considerations for the future, always include attempts to change the field of endeavor itself. Hence, it may not be useful for the policymaker to always look for the uniquely "best solution." It may be necessary to settle for a local temporary maximum—a good solution, rather than the best. In the elastic fabric of our present and future world, the "perfect" is often the enemy of the "good." When all is said and done, on a strategic level, the most useful aspect of the chaos and complexity metaphors is to remind us and help us to avoid falling into chaos.26

## Link-Geopolitics-5

**The high risk - low probability chains of events in the affirmative’s impact scenarios rely on a flawed security logic that justified the wars in Iraq and Afghanistan.**

**Kessler 08** [Oliver professor of Sociology at University of Bielefeld, “From Insecurity to Uncertainty: Risk and the Paradox of Security Politics” Alternatives 33 (08), 211-232 LO]

The problem of the second method is that it is very difficult to "calculate" politically unacceptable losses. If the risk of terrorism is defined in traditional terms by probability and potential loss, then the focus on dramatic terror attacks leads to the marginalization of probabilities. The reason is that even the highest degree of improbability becomes irrelevant as the measure of loss goes to infinity.50 The mathematical calculation of the risk of terrorism thus tends to overestimate and to dramatize the danger. This has consequences beyond the actual risk assessment for the formulation and execution of "risk policies": If one factor of the risk calculation approaches infinity (e.g., if a case of nuclear terrorism is envisaged), then there is no balanced measure for antiterrorist efforts, and risk management as a rational endeavor breaks down. Under the historical condition of bipolarity, the "ultimate" threat with nuclear weapons could be balanced by a similar counterthreat, and new equilibria could be achieved, albeit on higher levels of nuclear overkill. Under the new condition of uncertainty, no such rational balancing is possible since knowledge about actors, their motives and capabilities, is largely absent. The second form of security policy that emerges when the deterrence model collapses mirrors the "social probability" approach. It represents a logic of catastrophe. In contrast to risk management framed in line with logical probability theory, the logic of catastrophe does not attempt to provide means of absorbing uncertainty. Rather, it takes uncertainty as constitutive for the logic itself; uncertainty is a crucial precondition for catastrophies. In particular, catastrophes happen at once, without a warning, but with major implications for the world polity. In this category, we find the impact of meteorites, Mars attacks, the tsunami in South East Asia, and 9/11. To conceive of terrorism as catastrophe has consequences for the formulation of an adequate security policy. Since catastrophes happen irrespectively of human activity or inactivity, no political action could possibly prevent them. Of course, there are precautions that can be taken, but the framing of terrorist attack as a catastrophe points to spatial and temporal characteristics that are beyond "rationality." Thus, political decision makers are exempted from the responsibility to provide security-as long as they at least try to preempt an attack. Interestingly enough, 9/11 was framed as catastrophe in various commissions dealing with the question of who was responsible and whether it could have been prevented. This makes clear that under the condition of uncertainty, there are no objective criteria that could serve as an anchor for measuring dangers and assessing the quality of political responses. For example, as much as one might object to certain measures by the US administration, it is almost impossible to "measure" the success of countermeasures. Of course, there might be a subjective assessment of specific shortcomings or failures, but there is no "common" currency to evaluate them. As a consequence, the framework of the security dilemma fails to capture the basic uncertainties. Pushing the door open for the security paradox, the main problem of security analysis then becomes the question how to integrate dangers in risk assessments and security policies about which simply nothing is known. In the mid 1990s, a Rand study entitled "New Challenges for Defense Planning" addressed this issue arguing that "most striking is the fact that we do not even know who or what will constitute the most serious future threat."51 In order to cope with this challenge it would be essential, another Rand researcher wrote, to break free from the "tyranny" of plausible scenario planning. The decisive step would be to create "discontinuous scenarios . . . in which there is no plausible audit trail or storyline from current events"52 These nonstandard scenarios were later called "wild cards" and became important in the current US strategic discourse. They justified the transformation from a threat-based toward a capability-based defense planning strategy.53 The problem with this kind of risk assessment is, however, that even the most absurd scenarios can gain plausibility. By constructing a chain of potentialities, improbable events are linked and brought into the realm of the possible, if not even the probable. "Although the likelihood of the scenario dwindles with each step, the residual impression is one of plausibility."54 This so-called Othello effect has been effective in the dawn of the recent war in Iraq. The connection between Saddam Hussein and Al Qaeda that the US government tried to prove was disputed from the very beginning. False evidence was again and again presented and refuted, but this did not prevent the administration from presenting as the main rationale for war the improbable yet possible connection between Iraq and the terrorist network and the improbable yet possible proliferation of an improbable yet possible nuclear weapon into the hands of Bin Laden. As Donald Rumsfeld famously said: "Absence of evidence is not evidence of absence." This sentence indicates that under the condition of genuine uncertainty, different evidence criteria prevail than in situations where security problems can be assessed with relative certainty.

## Link-Geopolitics-6

**Linear modeling of international relations is impossible**

**Kissane, 2010** – assistant dean at the Centre d'Etudes Franco-Americain de Management, lecturer at the

University of South Australia, PhD from the University of South Australia in International Relations theory (Dylan, “Mapping International Chaos”, found online)//BZ

Developing a theory of international politics demands that, like a map maker, the theorist decide which elements are important enough to include and which can be safely excluded without affecting the utility of the end product. Mapping a theory of international political chaos, however, complicates such choices as it is not at all clear what calculus can be used to determine which elements should be included and what weight is to be afforded to them when they are. This problem of interdependence under political chaos is similar to the problems natural scientists faced when adapting their inadequate linear models to what were found to be chaotic systems. Indeed, the example and experience of meteorologists and climatologists in the 1950s and 1960s are similar to the experiences of international relations theorists today who seek to consider the international system as chaotic. Drawing on the experiences of those meteorologists, a potential solution to the problem of interdependence is found whereby the chaos theorist in international relations to the problem of interdependence. This solution - a change in the expectations of the theorist as to what their theories can and should be able to accomplish as well as a change in the methodology by which assessment and predictions are made - allows for the analysis of a chaotic international system without necessarily excluding any particular element of that system nor always including the same elements in the assessment of an international situation. The resultant map of the international system both embraces the complexity of politics under chaos as well as offering an explanation of that system that the analyst can use to find their way in the world and that, after all, is the goal of every cartographer of the international system.

## Link-Political Transformation

**Politics is a complex system of social dynamics irreducible to the individual level – this causes aberrations that could never be predicted**

**Brown 96** [Thad A. Assistant Professor of Political. Science at UCLA, “Non Linear Politics” from “Chaos Theory in the Social Sciences: Foundations and Applications” LO]

Unfortunately, attempts to analyze complex political behavior often tend to attribute observable cooperation or conflict to the individual. Behavior in politically intricate situations is attributed to higher levels of political information, a deeper understanding of the game's rules, or superior strategies, and of course lots of information (or at least enough information so as not to be duped). Nearly all published theory on the iterative prisoner's dilemma fits into this category. What must be remembered and used to calculate strategies includes: discount values, prior encounters, likely future encounters and associated probabilities, who might use what piece of information to figure out what to do, the cost of keeping information, and so on. Of course, nobody thinks this way. And even if anyone did there is no guarantee that a successful strategy at one time will not be utterly unsuccessful at another. In real political interactions are we left to laws of chance? For decades we have seen glimpses of the complex individual-group nexus that defines politics. For instance, we know political beliefs are often based on socially cued ideologies by proxy. That is, individuals may faithfully reflect and follow over time the beliefs of others who possess developed abstract formulations of politics (Campbell et al. , 1960; Converse 1964). That most voters lack much useful political information or fail to behave rationally is rarely debated anymore (Ferejohn and Kuklinski 1990). But the end of such debates doesn't mean we really understand the mechanism that induces even the most basic forms of political behavior. Turnout is one example. Rational choice theorists still cannot understand why anyone would vote, given the costs relative to proportional influence. Empirical electoral analysts cannot figure out precisely why aggregate voting rates appear to be going down-or are they going up this year? As a good friend in industry says, there is something wrong with this picture. Social dynamics result from sets of local interactions between group members and their interactions with the environment. Logically, such signaling fits within a variety of classical social psychological perspectives that suggest individuals adapt to social environment (Asch 1951; Fetinger 1957) or form impressions about others based on behavioral experiences (Helder 1958). In politics we know that decision makers modify their own behavior and the influence of social environments through self-selection (Schelling 1978; Festinger 1981 ), avoidance (MacKuen 1990), migration (Brown 1988), or a generalized contagion process (Huckfeldt and Sprague 1987, 1988. 1993). Formally treating interactive political behavior within massively diverse collectives is tricky. Interactive behavior is peculiar in that it can neither be predicted nor analyzed by observing sets of individuals cross-sectionally, or even the time series from a given individual or group. Social dynamics and the concomitant social behavior cannot be reduced to individual behavior in the sense that isolated individuals cannot induce the variety and richness of global collective behavior prevalent in any political system. Social and political behavior is by definition holistic and synergetic (Haken 1978, 1983) and must be the product of interacting individuals who can communicate and modify their behavior as a consequence of their interactions. Any time series is a rough statistical characterization of a collective process. A power spectral analysis alone, for instance, cannot decide the dynamical rules that model the time series. Both a deterministic logistic map with maximum parameter values (Mayer-Kress and Haken 1981) and a stochastic system can generate a white noise signal such that a flat spectrum cannot tell which model is correct. Figuring out what drives the show for interactive social behavior poses some interesting problems. In political dynamics there are likely to be spatial and temporal phase transitions. For instance, we know that transition from a pattern selection phase to fully developed turbulence occurs via the intermittency (Kaneko 1989). Non linear interactions would almost demand that abrupt and widespread events occur unexpectedly. How to proceed is the question. Among the possible ways to investigate dynamical politics are simulations of intriguing spatial arrays with cellular automata. Cellular automata are formal dynamical systems with many discrete degrees of freedom. The beauty of automata is that while the rules of interaction are surprisingly simple, complex nonlinearity can be induced by the iterative nature of interaction. As nonlinear systems, cellular automata can display the full array of dynamics of any real , living system, from fixed points to cyclical behavior to chaos. Can political life be the product of simple, primitive models? Cell-space models have been used in physics (Herrmann 1992), chemistry, and biology (Gutowitz 1991 ; Forrest 1991 ), and to a more limited degree in the economic and social sciences to investigate the ecological structure of behavior (von Hayek 1937; Schelling 1971, 1978; Cowen and Miller 1990). In politics, they may represent the potential to "program" the information available and used by entities (voters, groups, elites, nations, or whatever), and hence what we can discern from cellular automata may give us further insight into the information dynamics in real politics.

## Link-Climate-1

**Complexity key to climate – complexity denial worse than climate denial**

**Hendrick, 2009** – PhD in Conflict Resolution from Bradford University, contributor to the Oxford University Press (Diane, “Complexity Theory and Conflict Transformation: An Exploration of Potential and Implications”, <http://www.brad.ac.uk/acad/confres/papers/pdfs/CCR17.pdf)//BZ>

The 1990s saw much attention being paid to the link between environment, population and conflict in the context of human security. There are significant debates about the nature of the processes at work and differing conclusions about how, and where, to intervene to reverse downward spirals. Thomas Homer-Dixon is one of the theorists in this field who stresses the value of a complexity approach. He advises that: “At the methodological level, we need to explore how causation works at the interface between the physical/ ecological and social worlds. Environment-conflict research brings us face to face with some of the most intractable issues in philosophy of science, specifically whether causal generalizations describing the social world have the same status as those describing the natural world. Because systems in both these domains are fundamentally complex—characterized by huge numbers of components, causal interactions, feedback loops, and nonlinearity—environment-conflict researchers can gain insights from complexity theory. We urge greater receptivity to the concepts and findings of this rapidly developing field.” (Homer-Dixon, 2000 p. 89) Homer-Dixon is scathing towards those who deny the relevance of complexity approaches rather than taking up the challenge to find new ways to research complex problems: “The problem of complexity exists in the real world. It cannot be wished away by assuming that it resides only in the mind of the researcher. ... Researchers in a variety of fields increasingly acknowledge the reality of complexity and are developing powerful theories to understand complex systems. These theories raise serious questions about conventional (often mechanistic) explanations of social phenomena and about the conventional methodologies used to study these phenomena (Cowan, Pines, and Meltzer, 1994). Rather than denying complexity’s existence, ... social scientists should explicitly acknowledge the problems it creates for their research and try to develop methods—such as those focusing on causal mechanisms—for dealing with it.” (Homer-Dixon, 2006 p. 87)

## Link-Climate-2

**Complexity key to solve warming – individual actors.**

**Levy and Lichtenstein, 2011** – Levy is a Professor in Management and Marketing at UMass while Lichtenstein is an associate professor in management at UMass (David and Benyamin, “Approaching Business and the Environment with Complexity Theory”, Oxford Press, http://www.faculty.umb.edu/david\_levy/LevyLicht2011\_complexity\_chap32.pdf) //BZ

THE failure to establish an international agreement on climate change at Copenhagen in December 2009 highlights the challenge of managing complex problems at the interface of business and the natural environment (B&NE). Despite the broad consensus on the need for coordinated global action, Copenhagen represented a failure of collective action—and a triumph of inertia—as industries and countries struggled to reconcile narrow conceptions of economic interest with global demands for aggressive action. This unfortunate outcome can be understood in the context of the larger “sociotechnical system” within which business and policymakers are operating: a complex dynamic system comprising economic, technological, social, political, and ecological elements, generating complex interactions and unforeseen outcomes. Yet even as recriminations were flying at Copenhagen, some welcomed the opportunity to move beyond a centralized, top-down model of global climate governance. Instead, they embraced the opportunity for businesses, non-governmental organizations (NGOs), and governmental agencies to experiment with a plethora of innovative approaches to reducing emissions, which offer new opportunities for learning and creative solutions (Hoffmann 2011). Complexity theory provides a grounded theoretical basis for this more optimistic perspective by explaining how networked actors can display adaptive learning and emergent self-organization. In this chapter we examine the contribution of complexity theory to our understanding of B&NE, with a particular focus on climate change as an illustrative and representative example. We use the term “complexity” to refer to a group of concepts derived from systems theory, including complex dynamic systems theory, chaos, and emergence, among other disciplines. These provide insight into systemic tendencies towards patterned behavior, frozen inertia, and sometimes extreme instability. At a macro level, complexity theory explains why systems are often hard to comprehend and forecast, let alone manage and control. Yet complexity also offers micro-level tools and concepts to help innovative organizations improve sustainability through local initiatives of loosely networked agents (Senge et al. 2008). The field thus offers insights for steering systems toward sustainable transitions and enhancing resilience, without the hubris of complete control (Smith, Stirling, & Berkhout 2005).

**Complexity solves warming – addresses root cause of micro level consumption**

**Levy and Lichtenstein, 2011** – Levy is a Professor in Management and Marketing at UMass while Lichtenstein is an associate professor in management at UMass (David and Benyamin, “Approaching Business and the Environment with Complexity Theory”, Oxford Press, http://www.faculty.umb.edu/david\_levy/LevyLicht2011\_complexity\_chap32.pdf) //BZ

The existing literature on B&NE mostly focuses on the organizational level, where managers have authority and responsibility. While this literature is valuable, as exemplified in this Handbook, the narrow focus can obscure an appreciation of the emergent properties and holistic functioning of the broader sociotechnical system. Some (see Ehrenfeld [Chapter 33]; and Roome [Chapter 34] this volume) emphasize that sustainability is only meaningful as a concept at the system level. Even if firms embrace good environmental practice, the aggregate impact of our global production and consump-tion creates an unsustainable environmental trajectory for the planet and the businesses it sustains. Others (see Banerjee [Chapter 31]; and Gladwin [Chapter 38] this volume) link this dangerous inertia to the wider capitalist system in which business is embedded. Complexity theory provides a link between macro-level analysis of systems and micro-level understanding of organizational initiatives that might contribute toward potential solutions. This presents a critically important research agenda for understanding and potentially overcoming the disjuncture between the beehive of corporate sustainability efforts and the deteriorating state of the planet. Complexity offers new ways of addressing environmental impacts at the system level, such as supply chains (see [Klassen & Vachon [Chapter 15] this volume) and geographic industrial ecologies (see Lifset & Boons [Chapter 17] this volume). Yet many questions remain if complexity theory is to be of practical use. What combination of top-down management and bottom-up initiatives is appropriate? How can points of leverage and influence be identified? What structural changes are needed to systems of finance, corporate governance, and energy pricing? What interventions might facilitate local initiatives and their coalescence into more sustainable production systems?

## Link-Climate-3

**Complexity theory key to solve root cause of warming – individual behaviors**

**Levy and Lichtenstein, 2011** – Levy is a Professor in Management and Marketing at UMass while Lichtenstein is an associate professor in management at UMass (David and Benyamin, “Approaching Business and the Environment with Complexity Theory”, Oxford Press, http://www.faculty.umb.edu/david\_levy/LevyLicht2011\_complexity\_chap32.pdf) //BZ

Complexity theory offers a conceptual framework that incorporates the essential unpredictability of economic and environmental systems with the emergence of distinctive and contingently stable patterns (Anderson et al. 1999; Ormerod 1998). Complexity was originally developed through advances in non-linear mathematics (Thom 1975), thermodynamics (Prigogine & Glansdorf 1971), and computational sciences (Simon 1962). These ideas were quickly adapted to social systems (Ulrich & Probtst 1984) and during the 1990s interest exploded in relation to management and organizations (Ashmos & Huber 1987; Kiel & Elliott 1996; Levy 1994; Merry 1995). Complexity theory goes beyond systems perspectives through advances in deterministic chaos theory (Lorenz 1963), power-law phenomena (Andriani & McKelvey 2009) and computational methodologies (Kauffman 1993; Davis, Eisenhardt, & Bingham 2007). Complexity theory recognizes that economic and environmental systems comprise a multitude of agents, from individuals to large organizations, with distinctive properties at each level. The economy, for example, comprises individual consumers and workers, firms, markets, industries, and national economies. While all these levels are interdependent, higher-level aggregations exhibit “emergent” properties that cannot easily be reduced to the interaction of lower levels (Holland 1998). Macroeconomics, for example, relies on constructs and theories that differ from those relating to individual firms and consumers. Some core properties of complex systems are shown in Table 32.1. Understanding complexity has been a long-standing concern of organization theory (Simon 1962). It offers insights into the emergence of patterned structure and order in higher-level systems, such as the Earth’s climate, economic organizations and social institutions, but also provides methods for finding fundamental relationships and simplicity behind complex phenomena. Complexity helps explain how systems can evolve in unexpected ways, exhibiting dramatic instability (Rudolph & Repenning 2002) and even collapse (McKelvey 1999). The weather, the global climate, and the economy are complex systems that exhibit such chaotic behavior (Brock, Hsieh, & LeBaron 1991). Chaos theory, a core science of complexity, explores systems in which the recursive application of non-linear functions gives rise to highly complex yet patterned behavior. Chaotic systems have several notable characteristics. First, they are unpredictable in the longer term, even though they are driven by deterministic rules. Weather conditions, for example, evolve due to well-understood interactions among variables such as humidity, air pressure, and temperature; however, the non-linear nature of these interactions makes it impossible to predict the long-term evolution of the weather system. The trajectory of chaotic systems such as these is highly dependent on initial starting conditions: the proverbial butterfly could theoretically cause perturbations that are amplified through successive interactions and reverberate throughout the entire weather system. An important corollary is that, although chaotic systems never return to the same precise state, the outcomes have predictable boundaries that generate well-known patterns (Dooley & Van De Ven 1999). Hurricanes emerge in late summer, though we never know their exact timing, path, or strength. Industries exhibit typical patterns of growth and maturity, yet evolve in unpredictable ways. These patterns are shaped by “strange attractors,” structural features of systems that constrain and mold their evolution. The patterns reflect macro-level emergent properties: hurricanes, economic recessions, and social movements exhibit system-wide patterns that are distinct from the properties of the components from which these systems emerge.

## Link-Climate-4

**Plan can’t solve warming – only a complex, layered approach solves**

**Levy and Lichtenstein, 2011** – Levy is a Professor in Management and Marketing at UMass while Lichtenstein is an associate professor in management at UMass (David and Benyamin, “Approaching Business and the Environment with Complexity Theory”, Oxford Press, http://www.faculty.umb.edu/david\_levy/LevyLicht2011\_complexity\_chap32.pdf) //BZ

Intervention in sociotechnical systems entails coordinated action by large numbers of actors, raising the problem of collective action. Hardin’s (1968) “Tragedy of the Commons” describes the tendency toward inaction in the face of the overuse of a common resource, such as the atmosphere, when private actors can free-ride and have little incentive to change their behavior. Various societal institutions have evolved to address such collective action problems (Ostrom 1990), but large-scale systemic crises require costly measures that demand an often lengthy process to build consensus. In part, such delays and disagreements reflect differences in technical understandings of complex systems. Action on climate change, for example, has been delayed while various parties argue over the best course of action: cap-and-trade versus carbon taxes, nuclear power versus renewable energy. Yet these differences are also deeply political, reflecting the asymmetric ways in which actors perceive that a crisis and remedial action will affect them. The fiercest proponents of action on climate change are the low-lying countries likely to be swamped by rising sea levels. In contrast, the countries and sectors who strongly oppose action tend to be heavily dependent on fossil fuels. Some rich countries might be willing to pay 1-2 per cent of GDP to cut emissions, but developing countries demand massive transfusions of capital if they are to transition from cheap fossil fuels. The failure to reach agreement in Copenhagen was largely due to these deep divisions. Problems of collective action are exacerbated by the need to coordinate multiple forms of intervention in complex dynamic systems. Neither a carbon tax nor a single technological breakthrough will, by itself, solve the climate problem, a point made by Jones (2009) in his system dynamics model of the evolution of the solar industry. Intervention in complex systems is also hindered by the likelihood of undesired and unanticipated consequences. Raising vehicle fuel economy standards reduces the cost of travel per mile, encouraging more car travel. Incentives to raise production of biofuels could raise food prices, and perhaps encourage clearcutting forests. These uncertainties have led some to suggest that complex systems are essentially unmanageable. Perrow’s (1989) study of the nuclear accident at Three Mile Island concluded that catastrophic accidents were “normal” in the context of highly complex socio-technical systems. Even the most carefully designed systems, Perrow argued, could not always prevent occasional human or technological failures from cascading into major disasters. The explosion and massive oil leak from BP’s oil well in spring 2010 highlights the challenge of anticipating every potential eventuality, especially when regulators and managers are under pressure to overlook risks to meet deadlines and profit targets.

## Link-Terrorism

**Complexity theory key to solve terrorism – better strategies and information exchanges**

**Beech, 2004** – Lieutenant Colonel in the US Army, US Army War College (Michael, “Observing al qaeda through the lens of complexity theory: recommendations for the national strategy to defeat terrorism”, USAWC Strategy Research Project, <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA423895)//BZ>

Reductionist models and tools used by today's senior leaders may not by themselves sufficiently clarify the pervasive ambiguity and complexities presented by the threat of anti-American global terrorism.8 Conversely, alternative theories that bring into focus networks and dynamic systems may help inform a US strategy to defeat global terrorism. The alternative theory this paper examines is Complexity Theory, which as any theory, seeks to explain or gain understanding and comprehension of the environment, behaviors and events around us. Theory provides a lens through which to clarify events and behaviors that might otherwise seem clouded and informs our decisions and actions relative to a set of phenomenon9 Complexity Theory views behaviors and actions as the interrelationship between a great many components parts.10 It refers to these interrelationships or systems as complex, because it is impossible to fully understand these systems by reducing them to an examination of their constituent parts.11 Instead, Complexity Theory holds that interactions produce collective behaviors and characteristics that are not exhibited when the components parts are examined individually.12 This is in contrast with reductionist theories, which seek to comprehend a phenomenon by examining its individual attributes and are insufficient to understand complex networks. Using Complexity Theory as a guide, this paper analyses al Qaeda as part of a global anti-American Islamic terrorist network and develops recommendations to improve the US strategy aimed at defeating terrorists from perpetrating further catastrophic acts against the United States homeland. This paper first describes the fundamental characteristics of Complexity Theory. Using these fundamental characteristics as criteria, this paper analyzes al Qaeda's behaviors to support the proposition that al Qaeda is a highly complex and adaptive network and identifies the elements of Al Qaeda's resilience to the current US counter terrorism strategy. Finally, to best inform a strategy against the terrorist network, this paper examines the underlying origins, conditions and sources upon which the network interdependencies emerge. Understanding the sources of these interdependencies provides evidence regarding al Qaeda's fitness and identifies elements to develop a more comprehensive strategy to defeat it.

## Link-Deterrence

**Deterrence theory fails – unpredictable variables and chaotic international relations overwhelm linear predictions**

**Jervis, 97** – professor of international affairs at Columbia (Robert, “Complex Systems: The Role of Interactions”, Complexity, Global Politics, and National Security, <http://www.dodccrp.org/html4/bibliography/comch03.html>) //BZ

Similarly, the effect of one variable or characteristic can depend on which others are present. Thus even if it is true that democracies do not fight each other in a world where other regimes exist, it would not follow that an entirely democratic world would necessarily be a peaceful one: democracies might now be united by opposition to or the desire to be different from autocracies and once triumphant might turn on each other. (The other side of this coin is that many of the characteristics of democracies that classical Realists saw as undermining their ability to conduct foreign policy—the tendency to compromise, heed public opinion, and assume others are reasonable—may serve them well when most of their interactions are with other democracies.) To further explore interactions it is useful to start with the basic point that the results cannot be predicted from examining the individual inputs separately. I will then move on to the ways in which the effect of one actor’s strategy depends on that of others, after which I will discuss how the actors and their environments shape each other, sometimes to the point where we should make the interaction itself the unit of analysis. First Interactions: Results Cannot Be Predicted From the Separate Actions The effect of one variable frequently depends on the state of another, as we often see in everyday life: each of two chemicals alone may be harmless but exposure to both could be fatal; patients have suffered from taking combinations of medicines that individually are helpful. So research tries to test for interaction effects and much of modern social science is built on the understanding that social and political outcomes are not simple aggregations of the actors’ preferences because very different results are possible depending on how choices are structured and how actors move strategically. Turning to international politics, Shibley Telhami argues that while pan-Arabism and pro-Palestinian sentiment worked to enhance Egyptian influence when Egypt was strong, they made it more dependent on other Arab states when Egypt was weak.14 From the fact—if it is a fact—that nuclear weapons stabilized Soviet-American relations we cannot infer that they would have a similar impact on other rivalries because variables that interact with nuclear weapons may be different in these cases (and of course may vary from one pair of rivals to another). Within the military domain one finds interaction effects as well: two weapons or tactics can work particularly well together and indeed most analysts stress the value of "combined arms" techniques that coordinate the use of infantry, artillery, armor, and aircraft. Events that occur close together also can have a different impact than they would if their separate influences were merely summed. The Soviet invasion of Afghanistan affected American foreign policy very deeply in part because it came on the heels of the Iranian revolution, which undercut American power, disturbed public opinion, and frightened allies. In explaining outcomes, we are prone to examine one side’s behavior and overlook the stance of the other with which it is interacting. Although deterrence theory is built on the idea of interdependent decisions, most explanations for why deterrence succeeds in some cases and fails in others focus on differences in what the defender did while ignoring variation in the power and motivation of the challenger, just as much policy analysis in general starts—and often ends—with the strengths and weaknesses of the policies contemplated and adopted. But one hand cannot clap; we need to look at the goals, resources, and policies of those with whom the actor is dealing. Teachers are prone to make the parallel error of not exploring how shortcomings in our students’ performances on tests may be attributable to the questions we ask.

## Link-Deterrence

**US military predictions impossible as irrationality and surprises dictate warfare.**

**Jervis, 97** – professor of international affairs at Columbia (Robert, “Complex Systems: The Role of Interactions”, Complexity, Global Politics, and National Security, <http://www.dodccrp.org/html4/bibliography/comch03.html>) //BZ

Further complexities are introduced when we look at the interactions that occur between strategies when actors consciously react to others and anticipate what they think others will do. Obvious examples are provided by many diplomatic and military surprises: a state believes that the obstacles to a course of action are so great that the adversary could not undertake it; the state therefore does little to block or prepare for that action; the adversary therefore works especially hard to see if he can make it succeed. As an 18th century general explained, "In war it is precisely the things which are thought impossible which most often succeed, when they are well conducted."15 In the war in Vietnam, the U.S. Air Force missed this dynamic and stopped patrolling sections of the North’s supply lines when reconnaissance revealed that the number of targets had greatly diminished: after the attacks ceased the enemy resumed use of the route.16 Both the success and failures of policies are determined interactively. This means that many cases of intelligence failure are mutual—i.e., they are failures by the side that took the initiative as well as by the state that was taken by surprise. Indeed, an actor’s anticipation of what others will do stems in part from its estimate of what the other thinks the actor will do. In many cases of surprise a state sees that a certain move by the adversary cannot succeed and therefore does not expect the other to take it: the U.S. did not expect the Russians to put missiles into Cuba or Japan to attack Pearl Harbor because American officials knew that the U.S. would thwart these measures if they were taken. These judgments were correct, but because the other countries saw the world and the U.S. less accurately, the American predictions were also inaccurate.17

## Link-Middle East-1

**Middle East predictions are impossible- too many individual actors to linearize relations- complexity theory key**

**Taleb and Blyth, 2011** – Taleb is a Distinguished Professor of Risk Engineering at NYU Polytechnic while Blyth is a Professor of International Political Economy at Brown (Nassim and Mark, “The Black Swan of Cairo” <http://jamesshinn.net/wp-content/uploads/2011/04/The-Black-Swan-of-Cairo.pdf)//BZ>

As with a crumbling sand pile, it would be foolish to attribute the collapse of a fragile bridge to the last truck that crossed it, and even more foolish to try to predict in advance which truck might bring it down. The system is responsible, not the compo-nents. But after the financial crisis of 2007-8, many people thought that predicting the subprime meltdown would have helped. It would not have, since it was a symptom of the crisis, not its underlying cause. Likewise, Obama’s blaming “bad intelligence” for his administration’s failure to predict the crisis in Egypt is symptomatic of both the misunderstanding of complex systems and the bad policies involved. Obama’s mistake illustrates the illusion of local causal chains—that is, confusing catalysts for causes and assuming that one can know which catalyst will produce which effect. The final episode of the upheaval in Egypt was unpredictable for all observers, especially those involved. As such, blaming the cia is as foolish as funding it to forecast such events. Governments are wasting billions of dollars on attempting to predict events that are produced by interdependent systems and are therefore not statistically understandable at the individual level. As Mark Abdollahian of Sentia Group, one of the contractors who sell predictive analytics to the U.S. government, noted regarding Egypt, policymakers should “think of this like Las Vegas. In blackjack, if you can do four percent better than the average, you’re making real money.” But the analogy is spurious. There is no “four percent better” on Egypt. This is not just money wasted but the construction of a false confidence based on an erroneous focus. It is telling that the intelligence analysts made the same mistake as the risk-management systems that failed to predict the economic crisis—and offered the exact same excuses when they failed. Political and economic “tail events” are unpredictable, and their probabilities are not scientifically measurable. No matter how many dollars are spent on research, predicting revolutions is not the same as counting cards; humans will never be able to turn politics into the tractable random-ness of blackjack. Most explanations being offered for the current turmoil in the Middle East follow the “catalysts as causes” confusion. The riots in Tunisia and Egypt were initially attributed to rising commodity prices, not to stifling and unpopular dictatorships. But Bahrain and Libya are countries with high gdps that can afford to import grain and other commodities. Again, the focus is wrong even if the logic is comforting. It is the system and its fragility, not events, that must be studied—what physicists call “percolation theory,” in which the proper-ties of the terrain are studied rather than those of a single element of the terrain. When dealing with a system that is inherently unpredictable, what should be done? Differentiating between two types of countries is useful. In the first, changes in government do not lead to meaningful differences in political outcomes (since political tensions are out in the open). In the second type, changes in govern-ment lead to both drastic and deeply unpredictable changes. Consider that Italy, with its much- maligned “cabinet instability,” is economi-cally and politically stable despite having had more than 60 governments since World War II (indeed, one may say Italy’s stability is because of these switches of government). Similarly, in spite of consis-tently bad press, Lebanon is a relatively safe bet in terms of how far governments can jump from equilibrium; in spite of all the noise, shifting alliances, and street protests, changes in government there tend to be comparatively mild. For example, a shift in the ruling coalition from Christian parties to Hezbollah is not such a consequential jump in terms of the country’s economic and political stability. Switching equilibrium, with control of the government changing from one party to another, in such systems acts as a shock absorber. Since a single party cannot have total and more than temporary control, the possibility of a large jump in the regime type is constrained. In contrast, consider Iran and Iraq. Mohammad Reza Shah Pahlavi and Saddam Hussein both constrained volatility by any means necessary. In Iran, when the shah was toppled, the shift of power to Ayatollah Ruhollah Khomeini was a huge, unforeseeable jump. After the fact, analysts could construct convincing accounts about how killing Iranian Communists, driving the left into exile, demobilizing the demo-cratic opposition, and driving all dissent into the mosque had made Khomeini’s rise inevitable. In Iraq, the United States removed the lid and was actually surprised to find that the regime did not jump from hyperconstraint to something like France. But this was impossible to predict ahead of time due to the nature of the system itself. What can be said, however, is that the more constrained the volatility, the bigger the regime jump is likely to be. From the French Revolution to the triumph of the Bolsheviks, history is replete with such examples, and yet somehow humans remain unable to process what they mean.

## Link-Middle East-2

**Tumultuous areas like the Middle East are impossible to predict, especially in light of the Arab Spring. Linear predictions fail in policy action.**

**Hendrick, 2009** – PhD in Conflict Resolution from Bradford University, contributor to the Oxford University Press (Diane, “Complexity Theory and Conflict Transformation: An Exploration of Potential and Implications”, <http://www.brad.ac.uk/acad/confres/papers/pdfs/CCR17.pdf)//BZ>

So, attempts have been made to introduce complexity theory into thinking about social systems such as organisations, the world political system and the aid and development system Within peace research and practice there is also a move to address the system-like properties of conflicts within a complexity framework. Dennis Sandole seeks to establish that there was early recognition of this in the field, quoting Kenneth Boulding who implied that conflicts operate at the edge of chaos - not completely random but not in equilibrium (Sandole, 1999). Boulding’s insight could be phrased in complexity terms thus: slight perturbations could lead to bifurcation with unpredictable results given the sensitivity to initial conditions and nonliner relations within complex systems: “Human beings are moved not only by immediate pressures but by distant goals that are contemplated in the imagination. These goals are susceptible of change, often of dramatic change, as a result of apparently slight changes in current information. On the other hand, they also have a good deal of stability, and this gives a stability to the system in the large that it may not have in the small.” (Boulding, 1962 p. 24) In particular, intractable conflict qualifies for the epithet “complex”. The dual nature of instability and persistence noted by Boulding seems characteristic of such deep-rooted, long- lasting conflict: “a basic paradox of intractable conflicts: they are essentially stable despite tremendous volatility and change. If we consider the conflict in the Middle East for example, it appears by most accounts intransigent; with a past, present, and future cloaked in hate, violence, and despair. Yet, over the years we have also seen major changes in important aspects of the conflict such as in leadership, policy, regional circumstances, intensification and de-escalation of violence, intragroup divisions, popular sentiment, and international intervention strategies. In other words, we have seen extraordinary changes occur within a context of a pattern of stable destructive relations. This paradox of stability amidst change is evident in intractable conflicts at all levels, from estranged siblings and neighbors to warring ethnopolitical factions. They are at once frozen, unyielding, often persisting in hostile states for generations, yet they are also some of the most volatile and dynamic social processes on earth”. (Coleman, 2007 p. 3) The levels of conflict are mutually influencing from intra-personal through inter-personal to inter-group and international. Where conflicts are intractable (longstanding and deeply rooted) then there will be different conflict episodes within conflict phases reflecting different aspects of the conflict and engaging some of the same issues and parties but also drawing in new elements. The broader political, economic and social context plays into these and the key factors shaping the conflict change over time as leaders, policies, attitudes among the masses become more or less determining of the conflict dynamics (Sandole, 1999); (Mitchell, 2005). The complexity of conflict, in particular intransigent conflict, has then not only to do with the myriad mutually influencing factors but the non-linear relationships between these. In the light of this fact there are those in the field of peace and conflict research and application that have sought to use complexity theory to aid in the analysis of conflict and in the development of strategies for conflict transformation.

## Link-Middle East-3

**Middle East predictions are like economics, impossible to have good calculations and make good presumptions.**

**Taleb and Blyth, 2011** – Taleb is a Distinguished Professor of Risk Engineering at NYU Polytechnic while Blyth is a Professor of International Political Economy at Brown (Nassim and Mark, “The Black Swan of Cairo” <http://jamesshinn.net/wp-content/uploads/2011/04/The-Black-Swan-of-Cairo.pdf)//BZ>

Why is surprise the permanent condition of the U.S. political and economic elite? In 2007-8, when the global financial system imploded, the cry that no one could have seen this coming was heard everywhere, despite the existence of numerous analyses showing that a crisis was unavoidable. It is no surprise that one hears precisely the same response today regarding the current turmoil in the Middle East. The critical issue in both cases is the artificial suppres-sion of volatility—the ups and downs of life—in the name of stability. It is both mis-guided and dangerous to push unobserved risks further into the statistical tails of the probability distribution of outcomes and allow these high-impact, low-probability “tail risks” to disappear from policymakers’ fields of observation. What the world is witnessing in Tunisia, Egypt, and Libya is simply what happens when highly constrained systems explode. Complex systems that have artificially suppressed volatility tend to become extremely fragile, while at the same time exhibiting no visible risks. In fact, they tend to be too calm and exhibit minimal variability as silent risks accumulate beneath the surface. Although the stated intention of political leaders and economic policymakers is to stabilize the system by inhibiting fluctuations, the result tends to be the opposite. These artificially con-strained systems become prone to “Black Swans”—that is, they become extremely vulnerable to large-scale events that lie far from the statistical norm and were largely unpredictable to a given set of observers. Such environments eventually experi-ence massive blowups, catching everyone off-guard and undoing years of stability or, in some cases, ending up far worse than they were in their initial volatile state. Indeed, the longer it takes for the blowup to occur, the worse the resulting harm in both economic and political systems. Seeking to restrict variability seems to be good policy (who does not prefer stability to chaos?), so it is with very good intentions that policymakers unwittingly increase the risk of major blowups. And it is the same misperception of the properties of natural systems that led to both the economic crisis of 2007-8 and the current turmoil in the Arab world. The policy implications are identical: to make systems robust, all risks must be visible and out in the open— fluctuat nec mergitur (it fluctuates but does not sink) goes the Latin saying. Just as a robust economic system is one that encourages early failures (the concepts of “fail small” and “fail fast”), the U.S. government should stop supporting dictatorial regimes for the sake of pseudostability and instead allow political noise to rise to the surface. Making an economy robust in the face of business swings requires allowing risk to be visible; the same is true in politics.

## Link-Hegemony-1

**Unipolarity impossible- in a world of chaos it is impossible to maintain power influence. Long term predictions of international affairs are impossible.**

**Kissane, 2007** – assistant dean at the Centre d'Etudes Franco-Americain de Management, lecturer at the University of South Australia, PhD from the University of South Australia in International Relations theory (Dylan, “The possibility for theoretical revolution in international politics”, <http://works.bepress.com/dylankissane/16)//BZ>

From the first two assumptions, it could be assumed that unipolarity in the system is a rare occurrence. If unipolarity is defined as the situation where, within a system, one actor is preponderant and controls more than half of the resources within that system, it should be rare under a chaotic system. This is for two reasons. Firstly, and largely from assumption one, it is understood that polarity will not be stable within a chaotic system. Assuming a system with a significant number and variety of actors (as the international system as described must be} then unipolarity can be expected to be much less common than multipolarity even bipolarity. Imagine, for example, 10 units in a system. There are only 10 ways in which the system could be unipolar but 45 different bipolar pairings and 968 ways the system can be multipolar. With reference to simple probability alone, it seems unlikely that unipolarity would be a normal state of affairs for the international system. Secondly, as it is assumed that actors will seek security to ensure their survival in the system, a sole power that dominates the system - as in a unipolar system - is likely to be interpreted as a threat by at least some of the other actors in the system (Layne 1993; Christensen 2001). Thus, while unipolarity is possible, it is likely to be challenged by other actors and last only a short time. No polar distribution is necessarily unstable In considering polarity, it should also be noted that in a chaotic system no particular polar distribution of power is necessarily more stable or ordered than any other. As Diana Richards has previously shown, under chaos unipolarity, bipolarity and multipolarity all have the potential to be stable. Unlike the anarchy of neorealist theory, chaos does not favour one distribution of power or security to another in terms of bringing stability to the system. As Richards has argued, a chaotic model includes "stable configurations ranging from unipolar, bipolar, tripolar, egalitarian multipolar [and] multipolar” (1993, 69). Interactions impact on non-interacting parties. Finally, and with reference to all three assumptions, in a chaotic system an actor can be sure that their interactions will have effects other than those intended by the actor. With small events having the potential for great impact on the wider system, it is unlikely that interactions between actors can ever be truly 'controlled' or 'limited'. Furthermore, in a chaotic environment it is impossible for actors to predict all of the impacts of their interactions (Gleick 1987, 21). This is not to say that they can predict none - for why else would an interaction take place if some result were not thought in some way to be likely to result? - but they cannot predict all of the impacts and eventual results. Thus, actors are perpetually in a state of being able to draw reasonably accurate short-term predictions about the results of interactions but without being able to draw long-term conclusions.

## Link-Hegemony-2

**Linearization of American hegemony is false- relies on flawed international theory**

**Sil and Katzenstein, 2010** – Sil is an Associate Professor of Political Science at the University of Pennysylvania while Katzenstein is a Professor of International Studies at Cornell (Rudra and Peter, “Analytic Eclecticism in the Study of World Politics: Reconfiguring Problems and Mechanisms across Research Traditions”, part of UPenn articles collection, [http://www.polisci.upenn.edu/faculty/RSEclectic2010.pdf)//BZ](http://www.polisci.upenn.edu/faculty/RSEclectic2010.pdf)//BZ\)

Although still comparatively rare in the social sciences, eclectic scholarship is beginning to make an impression in certain fields. Such eclecticism may be identified in relation to distinct strands within a broadly defined research tradition.93 In the interest of brevity, we focus here on eclectic scholarship that cuts across research traditions in the fields of international relations and comparative politics. We neither pretend to offer an adequate summary of the arguments considered, nor assess their substantive accuracy or explanatory power. We do, however, view these works as meeting our three criteria for analytic eclecticism: they take on problems of broad scope, they develop complex causal stories at the level of middle-range theory, and they implicitly seek pragmatic engagement within and beyond the academe. To this extent, we regard these works as reasonable approximations of analytic eclecticism. In the study of international security, Robert Jervis’s American Foreign Policy in a New Era represents a creative move in the direction of eclecticism.94 While the study is focused on the United States’ policies in the post-Cold War era, the analysis is predicated on the assumption that a revolutionary transformation has taken place in the international system: A distinctive kind of security community has emerged, consisting of the most powerful and developed states in the world, each of which has forsaken the use of force in its dealings with other members (as evident in the absence of official war plans). Although many take this state of affairs for granted, Jervis points out that it is a novel phenomenon that needs to be problematized and explained. Even when security communities had emerged in the past, they did not include the most powerful and developed states in the international system. For Jervis, the current security community constitutes “proof by existence of the possibility of uncoerced peace without central authority,”95 and thus requires scholars and policymakers to adjust their theoretical assumptions about states’ perceptions, interests, and behavior. For this purpose, Jervis notes the strengths and limitations of theories embedded in the constructivist, liberal, and realist traditions. These include: constructivist theories emphasizing the norm of nonviolence and an emergent identity shared by capitalist democracies; neoliberal theories stressing the pacifying effects of democratic politics, economic interdependence, and joint membership in international organizations; and realist theories focusing on the presence of external threat, American hegemony, and the logic of nuclear deterrence. Noting that none of these theories can independently explain the emergence or dynamics of the new security community, Jervis proceeds to adopt an eclectic analytic framework that reformulates and combines several causal factors: the belief that territorial conquest is difficult and unnecessary; the recognition of the costs of war, particularly in a nuclear age; and, rooted in the spread of democracy, shifts in identity that reflect a sharp decline in militarism and nationalism as well as a growing compatibility in values among the most advanced major powers. Interestingly, the significance of these factors and the complex manner in which they interact depends on ongoing historical processes. For example, the evolution of the international economy has been marked by a disassociation between territoriality and national prosperity, which has increased the costs of territorial acquisition in relation to potential material benefits. Similarly, the high degree of cooperation among the members of the security community is in part a function of enduring legacies of the Cold War when these states, as members of a common alliance, were socialized to behave as “partners” and set aside conflict as a means to settle their grievances vis-a-vis one another. Significantly, Jervis does not treat his analysis as a purely academic exercise. He is also concerned about the practical implications of his eclectic analysis, specifically in relation to American foreign policy and the responses of other members of the security community. Jervis argues that, as a result of the Bush doctrine, “[w]e are headed for a difficult world, one that is not likely to fit any of our ideologies or simple theories.”96 While pessimistic, the latter prediction is not simply a polemical statement. It derives from Jervis’s recon-sideration ofthe contours of the present international envi-ronment, which requires an urgent updating of conceptions of national interest and of the present course of American policy. In particular, Jervis cautions that unilateral actions by the US since 9/11 have begun to undermine the trust of members of the security community who are increasingly concerned about American hegemony. However, he also notes that other members of the security community, to the extent that they wish to check US hegemony, are adopting new styles of balancing that involve subtle, coordinated efforts to socialize and entrap the US to keep its behavior “within acceptable bounds.”97 Whether or not one concurs with Jervis’ implied prescriptions, his analysis enables a more open-ended discussion among scholars and policymakers about the foreign policy implications of the multiple dimensions of a new, evolving international order.

## Link-Hegemony-3

**Moves to American leadership are unpredictable – too many international interactions**

**Lichtenstein, 2006** – Assistant Professor in Management at UMass (Benyamin, "Complexity leadership theory: An interactive perspective on leading in complex adaptive systems", part of a University of Nebraska-Lincoln Journal, <http://digitalcommons.unl.edu/managementfacpub/8>) //BZ

Traditional, hierarchical views of leadership are less and less useful given the complexities of our modern world. Leadership theory must transi-tion to new perspectives that account for the complex adaptive needs of organizations. In this paper, we propose that leadership (as opposed to leaders) can be seen as a complex dynamic process that emerges in the interactive “spaces between” people and ideas. That is, leadership is a dynamic that transcends the capabilities of individuals alone; it is the product of interaction, tension, and exchange rules governing changes in perceptions and understanding. We label this a dynamic of adaptive leadership, and we show how this dynamic provides important insights about the nature of leadership and its outcomes in organizational fields. We define a leadership event as a perceived segment of action whose meaning is created by the interactions of actors involved in producing it, and we present a set of innovative methods for capturing and analyzing these contextually driven processes. We provide theoretical and practical implications of these ideas for organizational behavior and organiza-tion and management theory. Introduction As twenty-first-century management continues to emphasize decentralized organizing structures and co-evolutionary ecologies of firms, institutions, and markets, there is a growing recognition that traditional top-down theories of leadership are at best overly simplistic (Osborn et al., 2002). That is, leading-edge theorists and the leaders they inform are questioning the assumption that the essence of leadership rests within the character or the characteristic behaviors of effective supervisors (Seers, 2004). Worse, the notion that a leader exogenously “acts on” organizations in order to achieve the leader’s objectives may be misguided in the presence of the insight that orga-nizations are highly complex and nonlinear (Meyer et al., 2005). There is also a growing realization that effective leadership does not necessarily reside within the leader’s symbolic, motivational, or charismatic actions. If leadership is not “in” a leader or “done by” a leader, however, how are we to insightfully conceive exactly what constitutes leadership and from where it originates? A novel approach for answering these questions is grounded in complexity science, namely the notion that leadership is an emergent event, an outcome of relational interactions among agents. In this view, leadership is more than a skill, an exchange, or a symbol - leadership emerges through dynamic interactions (Bradbury and Lichtenstein, 2000). “Complexity leadership theory” investigates the role of leadership in expediting those processes in organizations through which interdependent actions among many individuals combine into a collective venture (Drath, 2001; Meyer et al., 2005). Founding the approach of this paper on complexity theory per se moves us to a whole- systems view and thus away from the more traditional approaches that focus on variables and component parts. Instead, we will focus on: • Expanding the locus of leadership from the isolated, role-based actions of individuals to the innovative, contextual interactions that occur across an entire social system; • Extending current theory and practice by focusing on micro-strategic leadership actions across all organizational levels and across organizational boundaries; • Increasing the relevance and accuracy of leadership theory by exploring how leadership outcomes are based on complex interactions, rather than “independent” variables; • Highlighting the relational foundations of change in emerging organizational fields, through the idea that leadership occurs in the “spaces between” agents; • Providing a new and rich foundation for explaining the constructive process of collective action as well as the influential “behaviors” of collective actors; • Connecting to innovative methodologies that can enrich our understanding of how leadership gets enacted and received in complex environments.

## Link-Hegemony-4

**The aff’s analysis perpetuates a linear view of conflict that undermines military effectiveness and leaves us vulnerable**

**Beyerchen, 97** – Alan D., associate professor of history at Ohio State University, and a fellow of the American Association for the Advancement of Science (“Chapter 7: Clausewitz, Nonlinearity, and the Importance of Imagery,” Complexity, Global Politics, and National Security, ed. David S. Alberts and Thomas J. Czerwinski, National Defense University, <http://www.dodccrp.org/files/Alberts_Complexity_Global.pdf)RK>

What is the utility of thinking about war—for our potential opponents and ourselves—in nonlinear terms, especially in the high-tech, research-forefront metaphorical terms from the new sciences? For our opponents the usefulness may be the same as it was for Clausewitz. The Germans were underdogs to the French, and Clausewitz wanted to understand and use against the French their linearizing blindspots. He also needed to be the champion of disproportionate effects and unpredictability, for in a linear, predictable world Prussian resistance to Napoleon after 1807 was futile. The opponents of the United States will be looking for our blindspots in an effort to seize opportunities to surprise and shock us. They may also be able to compensate for their disadvantage in military confrontations such as the Gulf War by consciously striving to affect the political context in order to change the conduct of warfare. An understanding of the porousness of the boundaries between politics and war can be a **real weapon** against those who envision those boundaries to be impermeable. We need for our own sake to understand the limitations our imagination places upon us. Linearity is excellent for the systems we design to behave predictably, but offers a narrow window on most natural and social systems. That narrowness sets blinders on our perception of reality and offers a weakness for an opponent to exploit. But if we know our limits, we can minimize the extent and duration of our surprise, reducing its value to someone else. And an expanded sense of the complexity of reality can help us be more successfully adaptive amid changing circumstances. By thinking more constructively about nonlinearity, we might be able to design more robust systems when we need them. A new form of modeling that takes such concepts as self-organization to heart allows structures to bubble up from below rather than be imposed from above. With such tools we might come to understand better the biological and historical processes with which we must deal. And we may come to realize how **conventional, analytical predictive techniques can themselves stimulate a self-defeating, unfulfillable desire to control** more of the real world around us than is truly possible.

## Link—Environment

#### Traditional modeling excludes socioecological improvement in favor of consensus- stakeholders must take complexity into account to evaluate environmental harms

Zellner et al 12,

Moira Zellner et al, assistant professor in the Department of Urban Planning and Policy and a research assistant professor in the Institute for Environmental Science and Policy at the University of Illinois at Chicago,

Modeling, learning, and planning together: an application of participatory agent-based modeling to environmental planning, URISA Journal Jan, 2012  Volume 24,  Issue1, 1/01/2012

As a consequence of these barriers, modeling efforts often fail to lead to the learning necessary for changes in policy and behavior to occur because citizens find it difficult to interact with the model and interpret its outputs (Zellner 2008). Moreover, the outcomes predicted by "black box" simulation tools are strongly questioned by participants because the assumptions and interactions within the simulation are not revealed, especially when the results do not match the participants' beliefs and values (Dasgupta et al. 2010). As a result, participants rarely incorporate their own values and specialized knowledge into the spatial and dynamic models, or derive useful insights from the simulations to inform discussions that advance policy changes in the direction of socioecological improvement. Such collaborative processes eventually may lead to consensus but not necessarily to a better understanding of how the problem being addressed is complex and to policy that adapts policy goals to this new understanding, i.e., to learning. Helping stakeholders learn about complex environmental problems requires new skills and tools to support reasoning about complexity. Such reasoning ability would enable stakeholders to more readily recognize different forms of knowledge, scales, and interactions represented in their collective endeavor, and to expand their understanding of the problem from a propositional view of how individual pairs of variables interact to a view that acknowledges the networked structure of influences on variables of interest. Stakeholders thus would be better equipped to examine the relative influence of different variables both in terms of effect and relative manipulability, allowing communities to avoid making planning decisions that might seem to lead to socio-ecological improvement but to comparatively little net effect. The ability to reason about complexity would lead, therefore, to the cocreation of both knowledge and beliefs about appropriate steps toward resource sustainability, beyond the conditions for effective participation that are typically the focus of planning literature (Steyaert et al. 2007, Zellner 2008).

## Link—Expertism

**Policy methods must be interrogated—otherwise transportation planning is insulated from self-reflexivity**

Willson ‘1

Richard Willson ’01 (*Department of Urban and Regional Planning, California State Polytechnic University*) p. 2 *“*Assessing communicative rationality as a transportation planning paradigm”

To properly explore these questions, the transportation field needs an intense dialogue about planning processes and a willingness to look at how transportation planning really works. This effort has been hampered by the fact that transportation planners and planning theorists generally ignore one another. Communicative rationality has not been reviewed in transportation journals; planning theory research seldom links to transportation planning. Furthermore, theory articles are often presented in language that is difficult to understand and disconnected from practice. In taking up these questions, therefore, I am seeking to foster a conversation between transportation planners and planning theorists, one that will improve the quality of transportation planning and add rigor to planning theory. There is tension between the formal process of planning based on scientific, instrumental rationality and the day-to-day reality of political bargaining and gamesmanship. One might argue, therefore, that a concern with transportation planning process is irrelevant, taking the view that real planning does not occur in formal planning processes, or in the preparation of plans, but through project entrepreneurship, bargaining and the exercise of political power. Transportation plans, then, either add sanction to what has already been decided or provide technical information that shifts the power among competing interests. I agree that this is sometimes the case, but if it is true that planning does not matter, it should not be that way.

## Expertism/Cost-Benefit Analysis

#### Differing “local ontologies” between their authors ensures their cost benefit analysis is flawed

Naess 06,

Petter Naess, Aalborg University, Cost-benefit analyses of transportation investments: neither

critical nor realistic, Journal of Critical Realism, Vol. 5, No. 1, 2006, pp. 32-60

The forecasts are worked out by experts who belong to a particular professional ‘culture’. In modern society, different sectors represent different ‘cultures’ with varying values, attitudes and perceptions of the situation. Within each sector, established rules, standard operating procedures and routines govern the actions of the agents.25 Arguably, a ‘local ontology’ prevails among transport analysts, assuming that neither the total amount of travel within a region nor the distribution of travellers between different modes of transport is influenced by changes in the road capacity26. This inevitably produces unreliable results of the transport analyses, and accordingly also unreliable results of the cost-benefit analysis based on these traffic forecasts. In particular, these errors are serious in situations where there are politically adopted aims of dealing with congestion problems in other ways (e.g. through land use policy, improved public transport and road pricing) than through road development facilitating traffic growth.27

## Expertism

#### Public involvement is needed for policymaking, the affirmative fails to do this

Quick and Zhao 2011 [ Kathryn S. Quick and Zhirong Jerry Zhao, Assistant Professors, Suggested Design and Management Techniques for Enhancing Public Engagement in Transportation Policymaking, October 2011]

The challenges of including diverse constituencies in public policymaking are¶ longstanding and well documented in the transportation arena [71,52]. Indeed, across all sectors,¶ not just transportation policy, diversity and equity in access to public engagement are particularly¶ persistent concerns of engagement practitioners and scholars alike [76,77,78]. In general,¶ individuals of higher socioeconomic status are more likely to have the requisite time, money, and¶ civic engagement skills [79,80] or Internet access [81] to participate, and those with greater¶ individual and collective social capital are more engaged [82,83,84]. Thus “the public” who¶ participate in engagement efforts may not be representative of the opinions and knowledge of the¶ public at large, since people who come to such meetings are unusually interested and informed¶ about the issues under discussion.¶ However, in transportation there is sometimes a reversal of the usual pattern of poor¶ participation by low-income, non-white, less educated constituents. For example, low-income¶ communities are not only disproportionately affected by transit services, but disproportionately¶ interested in participating in transit policy and planning discussions [85]. Alternatives to the¶ traditional public hearing form of public engagement may be necessary to gather their input,¶ such as telephone surveys or gathering input at transit stations and other locations convenient to¶ their everyday patterns of movement [85]. Purposeful efforts to provide outreach in multiple languages and have translators for face-to-face interactions are important for reaching¶ constituents who are not comfortable communicating in English [86]. Public and nonprofit¶ organizations frequently think of churches as an effective venue for reaching non-white¶ constituents about public issues, but this strategy is not always welcomed by the target¶ community; groups of Spanish-speakers surveyed about transit decision-making in Washington,¶ D.C., for example, were divided about whether they would welcome this or would very much¶ prefer to have church reserved for religious messages [86].¶ Another challenge of engaging diversity in transportation planning is recognizing and¶ enlisting a sufficient level of diversity without lumping constituents into stakeholder groups that¶ do not capture their full range of interests. The concept of the “public” is complicated and multifaceted¶ in transportation; there are, for example, strong differences in the interests and preferred¶ modes for public engagement of the “freight community” and “passenger community” in¶ infrastructure planning [87]. Similarly, bicyclists are not a homogenous group, and¶ misunderstandings and controversies may arise if recreational riders, “vehicular riders” who¶ commute and occupy a lane like other vehicles, and long-distance riders are lumped together as a¶ single interest group [88,56]. Nor should transportation professionals orient themselves too much¶ to stakeholder groups, warn some researchers who are concerned that considerable efforts to¶ engage organized special interest groups may exclude “ordinary people,” raising the danger that¶ a vocal, and perhaps unrepresentative, minority of the public could have undue influence on¶ policymaking [42].

In considering the purposes of the engagement process, we suggest that policymakers¶ consider not only the scope of the immediate task that they are trying to accomplish through¶ engagement but also whether there are other outcomes they would like to seek through the¶ process of engagement itself. To approach the latter question, it is helpful to recognize that¶ participation, defined as involving the public to provide input on a policy or project proposed by¶ policymakers [30], is just one mode of engaging the public in policymaking.¶ For this report, Kathryn Quick has developed a nested hierarchy of different approaches¶ to public engagement to help visualize the differences among them (Figure 1). Each successive¶ level increases the depth of involving stakeholders in defining and addressing the problem. ***We¶ invite policymakers to consider moving beyond participation,*** for several reasons.¶ The context for this provocative suggestion is that, across the transportation sector, most¶ public engagement appears to be in the basic participation mode, and that it does not seem to be¶ generating many benefits for transportation agencies or the public. That is, numerous¶ transportation agencies seem dissatisfied with the commonplace methods of involvement. A¶ survey of 107 state transportation agencies responsible for citizen engagement (conducted in¶ 1996) found that public hearings (followed by advisory committees and citizen surveys) were¶ both the most commonly used method for engaging the public (due to statutory requirements)¶ *and* considered by respondents to be the least effective method [69]. Therefore, we provide this framework for considering other approaches. The benefits of¶ public engagement described in the opening of this report result from the most basic level of¶ engagement, participation to inform the public about policies and to gain their input. The other¶ modes of engagement require different roles and commitments from policymakers, but they offer¶ additional impacts that may be desirable in some settings. In brief, deliberative, collaborative,¶ adaptive, and inclusive frameworks provide ways for communities – defined broadly to¶ incorporate government agencies, businesses, interest groups, and the general public – to sustain¶ and create resources and civic capacity that are valuable for community-based problem solving,¶ including interpersonal relationships, community attention to issues, and knowledge [94,95,22].

## Expertism

Layouts for Transportation infrastructure requires lived experience and participation of the people

Quick and Zhao 2011 [ Kathryn S. Quick and Zhirong Jerry Zhao, Assistant Professors, Suggested Design and Management Techniques for Enhancing Public Engagement in Transportation Policymaking, October 2011]

A prominent challenge particular to transportation is how to engage expert and lay¶ perspectives in technically complex decisions that have substantial impacts on the general public¶ (Section 2.2.2). In these two cases, transportation specialists have *not* been checking their¶ expertise at the door in these efforts. Instead, the engagement processes have been a context for¶ public managers to use their expertise to support emergent opportunities. They brought their¶ knowledge to respond to how participants steer the deliberations. In reformulating the cycle¶ agenda, they provided technical assistance to organize the Bike Summit, prepared the bikefriendly¶ city application, and revised city policies to reflect the new norms for bike lanes.¶ However, the inclusion of “lay” as well as “expert” perspectives transformed the kinds of policy¶ outcomes that became possible. For example, lay perspectives challenged expert preconceptions¶ of the problem, leading to a transformation of the GGR “connections” theme from public transit¶ to incorporate cycling and variegating “cycling” to include several kinds of cycling. The¶ planning process validated and utilized knowledge gained through lived experience. For¶ example, cyclists’ fear of “getting doored” contributed to understanding the road design problem.¶ Expert knowledge was articulated by parties in both traditionally “lay” and “expert” roles, e.g., cyclists pushed the shift from “roads are for cars” to the “road diet” and “complete street”¶ paradigms that both city staff and cycling advocates now use for thinking about multiple uses of¶ roadways. Adopting “complete streets” as a new common framework for city traffic safety¶ engineers, bike advocates, pedestrian advocates, and planners removed some of the oppositional¶ contests over whether busses, cars, pedestrians *or* cyclists would get the upper hand. This new¶ framework allowed people to connect across their statuses as organizational insider or outsider,¶ across their different kinds of knowledge and different orientations to the problem because it¶ reframed the issue so these differences were inconsequential. In the two completed projects, discussion tools were designed to bring lay and expert¶ knowledge to bear and to remove barriers to understanding one another’s perspectives. For¶ example, using cross-section diagrams to explore various road lay-out options helped to bring¶ together perspectives on legal and street maintenance requirements for minimum lane widths,¶ cyclists’ preferences for safety, and business owners’ concerns about on-street parking. In all¶ three efforts, the transportation and planning agencies did transform their roles from the¶ traditional roles of being project leads and implementers to being conveners and partners in¶ transportation policymaking and implementation. New organizational arrangements were created¶ within and across the city organization and others around biking issues, e.g. to organize and¶ sponsor the Bike Summit, submit successful application to be a bike-friendly city, and create a¶ new mountain biking park. These employ an array of organizational arrangements, including¶ creating a new organization (the bike coalition); volunteers’ designing, building, and maintaining¶ a bike park on city-owned land through a legal contract with the city; the city’s providing¶ technical assistance to start the new nonprofit in which it is a partner; and using the corridor¶ planning steering committee to intentionally de-center the authority of large institutions (the city,¶ the hospitals, the R&D center, the universities) that could dominate the decision-making or opt¶ out of coordinated action. The transportation plan generated through public engagement in GGR¶ was a “work plan” for the city’s planning department to then lay the groundwork for¶ implementation inside the city government (e.g., establishing the regulatory frameworks,¶ securing buy-in from several city departments and commissions) to do the work. Once that was¶ established, the planning department invited cycling interest groups, the public, and¶ philanthropists to re-engage to find resources to implement the plan, through the city or other¶ agencies.

## Expertism

#### The Affirmative acts like the sovereign that tries to enforce people to make “rational” decisions, which proves that people aren’t rational

Quick and Zhao 2011 [ Kathryn S. Quick and Zhirong Jerry Zhao, Assistant Professors, Suggested Design and Management Techniques for Enhancing Public Engagement in Transportation Policymaking, October 2011]

Concerns over climate change, air pollution, health and congestion on the road network,¶ coupled with falling oil reserves, are leading governments to take action to change the way¶ people travel. However, for a variety of reasons, not all countries are equally committed to¶ behaviour change. This is partly because of different levels of awareness, lack of resources¶ or limited political power. Behaviour change and climate change mitigation policies are¶ made in political, economic, cultural and geographical contexts, largely different from one¶ country to another. For example, there is a debate about the balance between the low¶ emissions and high vulnerability of the developing world to climate change, compared to¶ high emissions in the developed world, leading to arguments about climate justice and¶ climate change migration (Liverman, 2008). Individuals are being encouraged to travel in more efficient and sustainable ways.¶ Behavioural change initiatives have been shaped by a wide range of theories and concepts¶ that have emerged from economics, psychology, sociology, criminology, and more recently ‐¶ behavioural economics. Different approaches have been applied to encourage, enforce and¶ nudge citizens to make choices that are better for them and society.¶ Alongside the ‘hard’ transport policy measures, such as economic interventions, changes to¶ infrastructure, legislation and enforcement, which modify the objective environment (and¶ considered by many as limiting their freedom to make travel choices), there is a growing¶ interest in the design and implementation of a range of alternative or supplementary¶ ‘softer’ interventions. Soft behavioural change interventions such as education, training and¶ information provision, and mass‐media persuasion (through advertising and the use of¶ campaigns) have been successfully applied in a wide range of domains, among them public¶ health, energy consumption, and transport ‐ in which the approach is also known as¶ ‘smarter choices’ (Cairns et al., 2008) or ‘mobility management’ (Taniguchi and Fujii, 2007).¶ This approach has attracted increased attention from both transport policy makers and¶ researchers in EU countries, Australia, Japan and elsewhere. Somewhat inspired by social¶ psychology (although not applying systematic frameworks in the design and evaluation of¶ measures), the UK Smarter Choices is a wide range of rather diverse measures including¶ persuasive and information elements applied in workplace and school travel plans,¶ personalised travel planning, and general marketing campaigns.

## Link—Institutional Reductionism

#### Reductionist institutional analysis leads to gaps in knowledge of environmental governance and terminal unsustainability.

Naess 06,

Petter Naess, Aalborg University, Cost-benefit analyses of transportation investments: neither

critical nor realistic, Journal of Critical Realism, Vol. 5, No. 1, 2006, pp. 32-60

Fundamentally, cost-benefit analysis of transportation investment projects serves as a legitimating of a market- based development within a sector where the adopted political goals imply that the hitherto dominating, demand- led ‘predict and provide’ approach should be replaced – or a least supplemented to a higher extent than currently – by strategies meeting accessibility needs in other ways than through facilitating more traffic. More generally, cost-benefit analysis promotes a deregulatory agenda under the cover of scientific objectivity.58 Several researchers have pointed to the fact that transportation is a sector where deviations between official goals and implemented measures are particularly high.59 To a high extent, the official goals reflect the need to obtain a more environmentally sound and accident-preventing development in the transportation sector. Such needs are not captured in an adequate way in cost-benefit analyses: Long-term environmental consequences are systematically and dramatically underestimated, and willingness-to-pay investigations are hardly able to account for the multi-faceted social value of environmental qualities such as climatic conditions, clean air, or the combined function of a particular area as a beautiful landscape, an outdoor recreation area, a rich ecosystem, and the habitat of particular species (some of which may be rare or threatened by extinction). The neglecting of the difference between demand and societal needs may be part of the reason why ‘decisions on transport policy is a field where a substantial gap between intentions and realities is common both at national and local level’.60 The political consequence of this is a development within the transportation sector where increasing mobility, in particular by car and airplane, is given priority at the cost of environmental concerns.

## Link—Predictions/Linearity

#### Transportation policy cannot be predicted through casual models- it’s a complex system with many inner workings

Naess 06,

Petter Naess, Aalborg University, Cost-benefit analyses of transportation investments: neither

critical nor realistic, Journal of Critical Realism, Vol. 5, No. 1, 2006, pp. 32-60

Many of the impacts dealt with in cost-benefit analyses of transportation investment projects are expected changes in human behavioural pattern resulting from the projects. This applies, for example, to time savings and changes in traffic accidents, emission levels and noise. Economic valuation of these effects presupposes that it is possible to predict each of these outcomes with a high degree of accuracy. However, for several reasons, such precise predictions will hardly be possible.

Above, the inadequate ‘local ontology’ prevalent among transport modelling engineers was discussed. However, even if the current transport modelling tools were replaced by models representing state-of-the-art knowledge about relevant mechanisms influencing travel behaviour, precise prediction about the future amount of traffic and its distribution between modes of conveyance would not be possible.

Several theorists of science, including a number of prominent critical realists,41 have rejected the possibility of making any scientifically based predictions at all about events and activity patterns in society.42 Elsewhere, I have argued against this highly pessimistic assumption, which would have dramatic implications for planning and political government if it were true43. However, there are indeed important limitations regarding the exactness of the possible predictions. The theoretical and empirical knowledge relevant for assessments of travel behavioural impacts of transportation infrastructure projects is seldom context-independent. If such knowledge is to be used in impact assessments, it must therefore be adapted and modified according to the actual context. Both for this reason and because society is constantly changing, any predictions about the impacts of transport investment projects on travel behaviour will always be crude. Society is not a closed system, but a system where many different causal mechanisms are at work, combined in a more or less contingent way. Although the contexts of the relationships between transport infrastructure, urban form and travel may be considered ‘pseudo- closed’ systems rather than completely open systems, the event regularities that can be identified will always be context-dependent – in space as well as in time. Therefore, any generalization to other geographical contexts or to the future must include careful, qualitative assessments of possible differences between the original space/time context and the context to which we want to generalize the research results. Regarding the generalization across time, this implies a discussion of possible traits of development that may reproduce, weaken or strengthen existing relationships.

The predictions that are possible to make on the basis of social science studies (such as studies of the relationships between urban land use, transport infrastructure and travel) are therefore of the crude ‘rule of thumb’ type. They are limited to aggregate-level predictions of the impacts of the causal factor, not of future events or states (the latter being much more difficult and uncertain due to the impossibility of knowing the future combination and development of a multitude of other causal mechanism influencing travel behaviour). They are also necessarily non-exact, i.e. limited to the direction and order of magnitude of the impact.44 These limitations have their important implications regarding the levels of measurement – ordinal, interval or ratio – that can reasonably be used when assessing behavioural consequences of transport investment projects.

## Link—Quantifiable Models

**Statistics aren’t enough—political advocacies are implicit in their quantified studies.**

Willson ‘1

Richard Willson ’01 (*Department of Urban and Regional Planning, California State Polytechnic University*) p. 6 *“*Assessing communicative rationality as a transportation planning paradigm”

The claims for objectivity in data and models that underpin instrumental rationality have been challenged from numerous standpoints. Quantification draws attention to some things and hides other things, such as equity issues or qualitative considerations. For example, studies of travel patterns by gender reveal differences formerly hidden in aggregate data. Wachs (1985) points out that models are also manipulated to produce predetermined outcomes. More broadly, Throgmorton (1993) argues that analytic techniques do not present an objective truth, but instead act as figures of speech and argument. In other words, a survey instrument or model does not exist disconnected from speechin a place and time. Surveys and models have an audience, they respond to what came before, they construct the roles of planners and others and they are built on language concepts. Finally, Harvey (1985) suggests that transportation models must respond to the fact that “values are invoked and mediated through the process, rather than resolved at an early stage” (pp. 458). When models ignore this reality, as they often do, their results become less relevant to decision making. Yet model results and analytic data are often presented as “findings” rather than a form of discourse.3 Many observers of transportation planning recognize that political and institutional aspects in transportation are ignored by the conventional approach (Wachs 1985). Reviewing planning theories that bear on transportation planning, Meyer and Miller (1984) advocate decision-centered transportation planning and identify a broad range of influences on the planning process, including rational comprehensive planning, incrementalist planning, advocacy planning, policy planning, and strategic planning. They argue for an approach that will help decision-makers reach good decisions rather than focus exclusively on the “right” answer.

# More Existential MPX-1

**Failure to adopt complexity causes multiple extinction level impacts**

**Gell-Mann, 97** – Murray, Nobel Laureate in Physics and professor at the Santa Fe Institute and co-chairman of the Science Board (“Chapter 1: The Simple and the Complex,” *Complexity, Global Politics, and National Security*, ed. David S. Alberts and Thomas J. Czerwinski, National Defense University, http://www.dodccrp.org/files/Alberts\_Complexity\_Global.pdf)RK

At this conference, issues of global politics and security will be addressed, including ones specifically concerned with the security of the United States. But security narrowly defined depends in very important ways on security in the broadest sense. Some politicians deeply concerned about military strength appear to resent the idea of diluting that concern by emphasizing a broader conception of security, but many thinkers in the armed services themselves recognize that military security is deeply intertwined with all the other major global issues. I like to discuss those issues under the rubric of sustainability, one of today’s favorite catchwords. It is rarely defined in a careful or consistent way, so perhaps I can be forgiven for attaching to it my own set of meanings. Broadly conceived, sustainability refers to quality that is not purchased mainly at the expense of the future—quality of human life and of the environment. But I use the term in a much more inclusive way than most people: sustainability is not restricted to environmental, demographic, and economic matters, but refers also to political, military, diplomatic, social, and institutional or governance issues—and ultimately sustainability depends on ideological issues and lifestyle choices. As used here, sustainability refers as much to sustainable peace, sustainable preparedness for possible conflict, sustainable global security arrangements, sustainable democracy and human rights, and sustainable communities and institutions as it does to sustainable population, economic activity, and ecological integrity. All of these are closely interlinked, and security in the narrow sense is a critical part of the mix. In the presence of destructive war, it is hardly possible to protect nature very effectively or to keep some important human social ties from dissolving. Conversely, if resources are abused and human population is rapidly growing, or if communities lose their cohesion, conflicts are more likely to occur. If huge and conspicuous inequalities are present, people will be reluctant to restrain quantitative economic growth in favor of qualitative growth as would be required to achieve a measure of economic and environmental sustainability. At the same time, great inequalities may provide the excuse for demagogues to exploit or revive ethnic or class hatreds and provoke deadly conflict. And so forth. In my book, The Quark and the Jaguar, I suggest that studies be undertaken of possible paths toward sustainability (in this very general sense) during the course of the next century, in the spirit of taking a crude look at the whole. I employ a modified version of a schema introduced by my friend James Gustave Speth, then president of the World Resources Institute and now head of the United Nations Development Program. The schema involves a set of interlinked transitions that have to occur if the world is to switch over from present trends toward a more sustainable situation: 1) The demographic transition to a roughly stable human population, worldwide and in each broad region. Without that, talk of sustainability seems almost pointless. 2) The technological transition to methods of supplying human needs and satisfying human desires with much lower environmental impact per person, for a given level of conventional prosperity. 3) The economic transition to a situation where growth in quality gradually replaces growth in quantity, while extreme poverty, which cries out for quantitative growth, is alleviated. (Analysts, by the way, are now beginning to use realistic measures of wellbeing that depart radically from narrow economic measures by including mental and physical health, education, and so forth.) The economic transition has to involve what economists call the internalization of externalities: prices must come much closer to reflecting true costs, including damage to the future. 4) The social transition to a society with less inequality, which, as remarked before, should make the decline of quantitative growth more acceptable. (For example, fuel taxes necessary for conservation adversely affect the poor who require transport to work, but the impact of such taxes can be reduced by giving a subsidy to the working poor—such as a negative income tax—that is not tied to fuel consumption.) The social transition includes a successful struggle against large-scale corruption, which can vitiate attempts to regulate any activity through law. 5) The institutional transition to more effective means of coping with conflict and with the management of the biosphere and human activities in it. We are now in an era of simultaneous globalization and fragmentation, in which the relevance of national governments is declining somewhat, even though the power to take action is still concentrated largely at that level. Most of our problems involving security—whether in the narrow or the broad sense—have global implications and require transnational institutions for their solution. We already have a wide variety of such institutions, formal and informal, and many of them are gradually gaining in effectiveness. But they need to become far more effective. Meanwhile, local and national institutions need to become more responsive and, in many places, much less corrupt. Such changes require the development of a strong sense of community and responsibility at many levels, but in a climate of political and economic freedom. How to achieve the necessary balance between cooperation and competition is the most difficult problem at every level. 6) The informational transition. Coping on local, national, and transnational levels with technological advances, environmental and demographic issues, social and economic problems, and questions of international security, as well as the strong interactions among all of them, requires a transition in the acquisition and dissemination of knowledge and understanding. Only if there is a higher degree of comprehension, among ordinary people as well as elite groups, of the complex issues facing humanity is there any hope of achieving sustainable quality. But most of the discussions of the new digital society concentrate on the dissemination and storage of information, much of it misinformation or badly organized information, rather than on the difficult and still poorly rewarded work of converting that so-called information into knowledge and understanding. And here again we encounter the pervasive need for a crude look at the whole. 7) The ideological transition to a world view that combines local, national, and regional loyalties with a "planetary consciousness," a sense of solidarity with all human beings and, to some extent, all living things. Only by acknowledging the interdependence of all people and, indeed, of all life can we hope to broaden our individual outlooks so that they reach out in time and space to embrace the vital long-term issues and worldwide problems along with immediate concerns close to home. This transition may seem even more Utopian than some of the others, but if we are to manage conflict that is based on destructive particularism, it is essential that groups of people that have traditionally opposed one another acknowledge their common humanity. Such a progressive extension of the concept of "us" has, after all, been a theme in human history from time immemorial. One dramatic manifestation is the greatly diminished likelihood over the last fifty years of armed conflict in Western Europe. Another is, of course, the radical transformation of relationships that is often called "The End of the Cold War." The recent damping-down of long-standing civil wars in a number of countries is also rather impressive. Our tendency is to study separately the various aspects of human civilization that correspond to the different transitions. Moreover, in our individual political activities we tend to pick out just one or a few of these aspects. Some of us may belong to organizations favoring a strong defense or arms control or both, others to the United Nations Association of the United States, others to ZPG or the Population Council, some to organizations plumping for more assistance to developing countries or to ones working for more generous treatment of the poor in our own country, some to organizations promoting democracy and human rights, some to environmental organizations. But the issues dear to these various organizations are all tightly interlinked, and a portion of our activity needs to be devoted to examining the whole question of the approach to sustainability in all these different spheres. It is reasonable to ask why a set of transitions to greater sustainability should be envisaged as a possibility during the coming century. The answer is that we are living in a very special time. Historians tend to be skeptical of most claims that a particular age is special, since such claims have been made so often. But this turn of the millennium really is special, not because of our arbitrary way of reckoning time but because of two related circumstances: a) The changes that we humans produce in the biosphere, changes that were often remarkably destructive even in the distant past when our numbers were few, are now of order one. We have become capable of **wiping out** a very large fraction of **humanity— and of living things** generally—if a full-scale world war should break out. Even if it does not, we are still affecting the composition of the atmosphere, water resources, vegetation, and animal life in profound ways around the planet. While such effects of human activities have been surprisingly great in the past, they were not global in scope as they are now. b) The graph of human population against time has the highest rate of increase ever, and that rate of increase is just beginning to decline. In other words, the curve is near what is called a "point of inflection." For centuries, even millennia, world population was, to a fair approximation, inversely proportional to 2025 minus the year. (That is a solution of the equation in which the rate of change of a variable is proportional to its square.) Only during the last thirty years or so has the total number of human beings been deviating significantly from this formula, which would have had it becoming infinite a generation from now! The demographic transition thus appears to be under way at last. It is generally expected that world population will level off during the coming century at something like twice its present value, but decisions and events in the near future can affect the final figure by billions either way. That is especially significant in regions such as Africa, where present trends indicate a huge population increase very difficult to support and likely to contribute to severe environmental degradation. In general, the coming century, the century of inflection points in a number of crucial variables, seems to be the time when the human race might still accomplish the transitions to greater sustainability without going through disaster. It is essential, in my opinion, to make some effort to search out in advance what kinds of paths might lead humanity to a reasonably sustainable and desirable world during the coming decades. And while the study of the many different subjects involved is being pursued by the appropriate specialists, we need to supplement that study with interdisciplinary investigations of the strong interdependence of all the principal facets of the world situation. In short, we need a crude look at the whole, treating global security and global politics as parts of a very general set of questions about the future.

## More Existential MPX-2

**Without complexity, inevitable crisis instability and nuclear war  
Saperstein, 97** – professor of physics at Wayne State (Alvin, “Complexity, Chaos, and National Security Policy: Metaphors or Tools?, Complexity, Global Politics, and National Security, <http://www.dodccrp.org/html4/bibliography/comch05.html>) //BZ

Analogously, if it were reasonable to mathematically model the world system of nations, a chaotic mathematical system would be a good metaphor for a crisis—unstable world. Being able to predict the critical "Reynolds number" for such a world model would be very important for the policy maker whose goal was to avoid crisis unstable conditions with their concomitant high probabilities for the outbreak of war (Saperstein 1984).16 (In the modern political/weapons-of mass-destruction world, there are no "test pilots" and we are all potentially sacrificial passengers.) In a Newtonian world paradigm (or in a Newtonian approximation to a Prigoginean world view), the notion of national security—and the goals of the corresponding policy makers—are fairly straightforward. Policy must be framed so as to either avoid war or to reap the benefits of winning a war (whose win can be "guaranteed" with associated costs less than expected gains). In either case, the prime goal is to maintain control of the future, to retain predictability and hence avoid crisis instability. Given a reasonable mathematical model of the system for which policy is being made, it can be used to explore for system characteristics which allow transition to chaos. The policymaker must then studiously avoid the corresponding behaviors or conditions. An example of interest to the strategist of bipolar nuclear arms races (in the context of the S.U. - U.S. Cold War) is the modeling of the Strategic Defense Initiative, the proposal during the Reagan Presidency to deploy a massive system of ground-based and space-based defenses against strategic-ranged ballistic nuclear missiles. The model (Saperstein and Kress 1988) presumed that each of the two antagonists would deploy similar offensive and defensive systems against the other (Fig. 3). The deployment numbers would be determined in response to the opponent’s deployed weapons numbers; the result is a non-linear interactive system whose stability can be investigated by conventional means: introduce a small disturbance into the system and compute how it grows. As expected, there are starting configuration numbers (of offensive and defensive missiles) for which the perturbations remain small, others for which they grow greatly and rapidly (Fig. 4). The latter configurations are the crisis-unstable systems which are to be avoided by the relevant strategic planners.17 The same paradigm has been used to explore questions of more academic interest. Using a non-linear Richardson18 model of the arms race between competing nations, a comparison (Saperstein 1991) was made of the stability region of three-nation systems (Fig.5a) with that of two-nation systems (Fig.5b). The former was found to be smaller than the latter, indicating that it is more difficult to stabilize a tri-polar world than a bi-polar world, a conclusion which has also been drawn by many "conventional" non-mathematical political scientists. Another concordance between the results of mathematical modeling of international systems and conventional analysis has been that a system of democratic states is less likely to have wars than a system including oligarchic states. The model conclusions (Saperstein 1992a) result from the differing values of the Richardson-type parameters19 stemming from democratic versus oligarchic societies. The differences arise since the (Newtonian) nation entities of the Richardson model, and hence their interactions, result from averages over a larger Newtonian model whose elements are the nation’s decision makers—citizens, politicians, officials—a large class in the democratic state, a small group in the oligarchic state. In the latter case, the interaction parameters resulting from the average are more likely to be large enough to produce an unstable system. Finally, a comparative stability analysis was made of systems of competing nations, each looking out for its individual security, versus systems of alliances, shifting so as to maintain a "balance of power" (Saperstein 1992b). Again, the result—that it is easier to stabilize a balance-of-power system—was expected from conventional political analysis. In all of the above cases, the chaos metaphor was used to steer policy makers away from potentially dangerous crisis instability situations—away from chaos. Alternatively, when war and its associated chaos is unavoidable, there is the traditional approach to the chaos of battle, an approach used by successful military planners whether or not they recognized or used the chaos metaphor. Since small perturbations can lead to largely different outcomes ("For want of a nail, a shoe was lost,... a kingdom was lost.") one appropriate response (characteristic of the U.S. military since Grant) has been to always deploy overwhelming forces, if they can be made available. (Have more than enough horses, so that the loss of a few would make no difference.) That is, the statistical fluctuations which mimic chaos usually scale as the square-root of N, the number of significant elements. For large enough N, the relative fluctuations are unimportant. An alternative to increasing the sizes of the force units available (the Newtonian elements of the system) is to increase the number of different types, their flexibility and rapid adaptability to changes. Have horses, mules, people, jeeps, well trained and available to carry out the required tasks. Better yet, have available alternative sets of tasks and immediate goals, which will lead to the final desired goal—if you can’t take that hill, take the other one. It is clear here that the new chaos metaphor offers no new tools to the military planner though, as has been previously suggested, it may significantly aid the military educator.

# Cmplxty turns case

Ignoring complexity produces infrastructure policies that backfire

Ghauche 2010 [Anwar Ghauche Bachelor of Engineering in Civil and Environmental Engineering, 2008 American University of Beirut Submitted to the Department of Civil and Environmental Engineering in partial fulfillment of the requirements for the degree of Master of Science in Transportation at the Massachusetts Institute of Technology, “Integrated Transportation and Energy Activity-Based Model.]”

There is a long history of projects and regulations that have had limited or even counterproductive results. These unforeseen effects are due to the failure of planners to capture all of the complexity inherent in urban dynamics. With the increasing risks of global warming, policymakers and planners need to make optimal or close-to-optimal decisions on how to use the available resources in order to reduce energy and fuel consumption. This thesis develops the framework for an urban model that serves as a decision support tool to inform sustainable policies and investments. The model discussed integrates the modeling of land use, transportation, and energy consumption by micro-simulating the behavior of households and firms in an urban area. This approach derives transport and energy consumption from human activities and includes the two-way feedback between each agent‟s behavior and the area‟s overall dynamics. We build upon complex systems theory and make an analogy with epidemiology modeling to derive the properties of heterogeneity-based, organized complex systems. We then translate the properties of these models with respect to the spatial and temporal resolutions of transportation, land market and energy systems‟ models. To achieve the integration of the three complex systems with activities in our framework, we present three different extensions to activity-based modeling in the household context. We first expand the scope of activities considered in activity-based modeling to fit the integrated transportation and energy scope. We then present the econometric techniques of latent variable and latent class modeling to capture individual heterogeneity. Third, we formulate the motivation behind activity participation and model the short- and long-term activity dynamics by operationalizing the concept of stress.4 We illustrate the potential of iTEAM in modeling different scenarios to demonstrate the role of our integrated transportation and energy model as a decision support tool for sustainable urban planning.

**CONTINUES…**

To put it in the words of JW Forrester (1969): “It has become clear that complex systems 2 are counterintuitive. That is, they give indications that suggest corrective action which will often be ineffective or even adverse in its results. Very often one finds that the policies that have been adopted for correcting a difficulty are actually intensifying it rather than producing a solution. The intuitive processes will select the wrong solution more often than not” The most common case of counter-intuitive results in transportation planning is that of the Braess paradox (Braess et al., 2005). This paradox occurs when the addition of a path in a network results in more overall congestion because of the selfish user-optimal Nash equilibrium that takes place. Such effects were observed in New York (Kolata, 1990) and Stuttgart. Another example of a transport policy that can have negative long term results is the case where an inprovement of certain modes in one region effectively alienates other regions.

## Cmplxty turns case-2

Complexity of infrastructure policy networks undermines implementation of plan

Klijn 2007, (**Erik-Hans Klijn,** *Department of Public Administration at Erasmus University Rotterdam, the Netherlands,* Managing Complexity: Achieving the Impossible? Management between complexity and stability: a network perspective, **Critical Policy Analysis** (2007), vol. 1, no. 3, pp. 252-277.)

As can be seen in the table these **arenas** were **embedded in different networks.** **This makes connections difficult and laborious** (Koppenjan/Klijn, 2004). **Sometimes actors in one arena are confronted by important decisions from other arenas, which they did not anticipate. This creates a completely different game situation.** The theoretical notion of game (or games) and arenas also gives us a view of the ‘flow of the game’. **The game can become more extensive** (and complicated!) **because new arenas are activated.** But the game can also become less extensive as arenas are disconnected**. Interestingly enough from a network perspective activating new and more arenas makes the game more complicated. It also enhances the opportunities to connect actors and decisions, however, and thus mobilises necessary resources.** The case of Delft once again provided an interesting and stimulating example of this paradox of enhancing complexity and opportunities for problem solving, and achieving interesting solutions at the same time. Table 4 shows which arenas were activated during the various stages of the game As can be seen in the table **decision-making expands and shrinks when arenas are activated and deactivated. The moment the decision-making game expands this requires more effort and skills from a management point of view** (Koppenjan/Klijn, 2004). The complexity of the game enhances**, more connections between actors have to be managed and developing a coherent content also requires more effort and attention**. **This is because there is a need to connect and incorporate more different perspectives of actors.** It was not until the municipality of Delft succeeded in expanding the decision-making process to other arenas that the project attained opportunities to succeed**. This would indicate that complexity has been a necessary condition to reach satisfactory outcomes and achieve the project!Besides complexity caused by the perceptions of actors and their different interpretation of information and knowledge, and the complexity caused by strategies and arenas, complexity of decision-making processes is also generated by institutional factors** (Scott, 1995; March/ Olsen, 1989). **If decision-making takes place in different arenas, which can be situated in different networks, actors will probably act from different institutional regimes. This creates difficulties in interactions because participants are not sure about basic interaction codes** (Koppenjan.Klijn, 2004).

## Cmplxty turns case-3

**Even if the case solves for transportation infrastructure, vulnerability of other systems make the plan useless in the face of catastrophic collapse**

**Ruth and Coelho 2006**

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“Managing the Interrelations Among Urban Infrastructure, Population, and Institutions” Forschungszentrum Nachhaltigkeit (artec-paper Nr. 136)] Ruth Coelho 5

**Dealing with Indivisibilities, Complementarities and Irreversibilities in Investment**

Infrastructure systems, such as water supply, flood control, and transportation networks are typically large and often function as a whole or not at all. A break in a water main, dike, or bridge can render the respective system incapable of providing a service. Investment in redundancy is key to being prepared for disruptions, such as during construction or an emergency. For example, having well-developed private transportation, bus, and rail systems in place can help to cut down on traffic jams in case one of the three is disrupted. Investing in redundancies, however, is costly. Similarly, ensuring adequate and reliable performance of one kind of infrastructure system often requires coordination with other infrastructure systems. Smooth operation of highways, for example may require development of drainage and flood management systems. Not only are there opportunity costs to sinking large investments in complementary infrastructure systems, but such investments can cause irreversible environmental degradation – in addition to degradation caused by putting the primary system in place. Developing complementary infrastructure systems can also lead to technology lock-in (Arthur 1989), and the associated phenomenon of carbon lock-in (Unruh 2000). With few exceptions, urban transport systems around the world are directly or indirectly fossil-fuel based. The ease and reliability of movement that they guarantee have spawned suburbanization in much of the Western hemisphere, and have fostered an increase in private car ownership, use of buses and rail. With the enlarged role of these systems in modern day-to-day life,

13 institutions have developed to manage these systems and to meet the needs of their constituents, and as a result have further locked in the existing infrastructure. As a consequence, institutional development in the past often has added to the inertia that makes adaptive management of infrastructure systems difficult in light of changing environmental conditions or technologies (Unruh 2002).

## Cmplxty turns case-4

**Framing is key to infrastructure planning—Their demand for quick response ensures disastrous policy outcomes**

Willson et al 08[Richard W. Willson, Marianne Payne, and Ellen Smith; Willson is Interim Dean in the College¶ of Environmental Design at California State Polytechnic University Pomona, Payne directs strategic¶ planning at the Bay Area Rapid Transit District¶ (BART); Smith manages BART’s planning in Contra Costa County; “Does Discussion Enhance Rationality? A Report from

Transportation Planning Practice”; Journal of the American Planning Association, 69:4, 354-367]

2. The communicative rationality approach improved¶ issue framing through the simultaneous consideration¶ of means and ends. Sometimes transportation plans develop consensual goals early on, but the goals do not significantly shape the policy choices. They are either vague or not meaningfully connected to strategy. Strategies are then debated with unresolved goal differences in the background. A communicative rationality approach seeks robust connections between ends and means and recognizes that connections occur in a recursive process, not a mechanistic optimization. This process makes issue frames—the paradigmatic structures¶ that shape understanding and imply strategies—visible¶ and changeable.¶ The BART process had this interplay between ends¶ and means. Directors offered different issue frames¶ (embedded with ends and means preferences) in freeranging¶ discussions. The narrative created frames that¶ shaped the understanding of the problem and implied¶ goals and strategies for action. In Workshop 1, the discussion¶ mixed arguments for particular policies with¶ broader issue frames and implied goals. In the midst of¶ heated exchanges, having a formal discussion about ends¶ would not have been useful.¶ Figure 5 offers an example of alternative issue frames.¶ The dialogue concerning these issue frames revealed the¶ alternative conceptions of BART’s mission, and it relied¶ on rhetoric, not data. It involved a series of issue frame¶ “offers” as directors sought agreement with their conceptualization.¶ Some frames were taken up by other directors;¶ others did not gain support. Collectively, directors¶ judged the validity of the claims as they sought a¶ workable basis for proceeding. Because the Board was so¶ evenly split, neither side had sufficient power to impose¶ an issue frame or distort the interaction to legitimize a¶ predetermined outcome.¶ The entire scope of the policy problem was reframed¶ toward the end of the process. Initially conceived as a¶ parking policy, the project was redefined as an access policy¶ in the second-to-last Board review. This broadening¶ brought in issues of access by bicycle, transit, and the¶ like. It allowed Board members to understand how their¶ differing interests might be accommodated. Because it¶ substantially broadened the scope of the policy, this¶ change required subsequent evaluations of access improvements¶ in station-level access planning processes.¶ Expanding the scope brought about a more robust,¶ albeit more general, consensus. The policy required early¶ action on consensual strategies (means such as altering¶ parking time limits) and a more locally based approach¶ for other strategies. A station- or corridor-specific implementation¶ process allowed for differences in intermediate-¶ level ends and created additional learning¶ opportunities.¶ Issue framing and the simultaneous consideration¶ of means and ends complicated the analytic tasks. All¶ discussions had implications for transit system ridership,¶ revenues and costs, equity, customer satisfaction,¶ joint development at transit stations, and other critical¶ issues. BART’s analytic processes were challenged in responding¶ to “what if” questions that were analytically¶ complex. BART was fortunate to have a station access¶ database with information on parking use levels, ridership,¶ and other key factors. Knowing what time each lot¶ filled, for example, gave a sense of the latent demand¶ should parking prices discourage some riders from using¶ BART. However, more complex questions, such as those¶ concerning the interplay of parking charges, ridership¶ (by time of day), station selection, system capacity, and¶ fare revenue were difficult to address. The pace of policy discussion only allowed for analytic approaches based on existing data and estimates; altering the process to collect new data or create a new modeling capability would have altered the flow of policy conversation and introduced rigidity and delays. The danger in this approach, of course, is reaching consensus on an approach that has technical flaws that would only be revealed by detailed modeling and evaluation. Using quick-response modeling, therefore, may not be appropriate for final decisions on capital-intensive projects that are irreversible.¶ In sum, the simultaneous consideration of means¶ and ends allowed for a serious engagement of issue¶ frames that enriched the discussion and learning. It contributed to a reframing of the issues on multiple levels, furthered understanding of the terrain of differences, and resulted in an incremental, experimental policy approach. It helped the Board move toward solving the realproblems, rather than their first impressions of what the problems were.

## Cmplxty turns case-5

**Reductionist policies fail because they don’t account for uncertainties between agents**

Klijn 07 [erik hans; Department of Public Administration at Erasmus University Rotterdam,¶ the Netherlands;Managing Complexity:¶ Achieving the Impossible?¶ Management between complexity and¶ stability: a network perspective; Critical Policy Analysis (2007), vol. 1, no. 3, pp. 252-277]

If we assume that every action an actor undertakes is only based on opportunistic motives,¶ like some economists as Williamson (1996) does, cooperation would almost be impossible.¶ This is especially the case in highly complex interaction settings where innovative solutions¶ have to be developed (Nooteboom, 2002).¶ If actors would solely rely on rational opportunistic behaviour they would never cooperate¶ in these situations. Cooperation would simply not survive because the outcomes are too¶ uncertain and the chances of opportunistic behaviour of other actors too great. Williamson¶ tells us however that trust is a confusing concept because it amounts to nothing more than¶ risk-taking. Or as he concludes in his essay on trust: “calculative relations should be described in calculative terms, to which the language of risk is exactly suited” (Williamson, 1996, pp:¶ 275). In his view, the notion of trust blurs the argument, because one party takes the risk that¶ the other party may be acting opportunistically, and the notion of trust as acting in good faith¶ (without calculation) does not add anything useful to the analysis of the situation.8¶ Despite what Williamsons tells us strategic choices of actors in complex situations cannot¶ be reduced to risk taking. Risk taking assumes that a calculation (or at least a prediction, how¶ incomplete that may be) can be made on the basis of which a rational decision can be made.¶ The assumption of calculation however does not fit the assumption of bounded rationality,¶ which is the anchor stone of neo-institutionalism. If possibilities of information gathering are¶ limited, then this certainly holds true for opportunities to assess strategic behaviour of other¶ actors. It is therefore impossible to base all decisions on a rational calculation of costs and revenues only. This is because the institutional rules are not enough to reduce these uncertainties in contacts between actors. With this assumption of risk taking and calculation the neoinstitutionalism¶ of Williamson returns to the same kind of hyper rationalism that she apparently¶ rejected in the classical economic approach.¶ Not surprisingly there is growing literature on trust in economic theory of contracting and¶ business that points out that trust can facilitate decisions to cooperate. Some of this literature stresses that trust relations are an asset which give firms an extra strong position on the market¶ because they are able to exchange information and create innovative products which firms¶ who lack these trust relation cannot (see Ring/van der Ven, 1992; Lane/Bachman, 1998;¶ Sako, 1998; Deakin/Wilkinson, 1998).¶ In complex interaction decisions, such as those in the Delft case, trust is important for cooperative strategies of actors.9 Trust will encourage actors to exchange information, to¶ engage in interaction and take risk and trust is a positive factor for engaging in innovations¶ (Ring/Van der Ven, 1992; Parker/Vaidya, 2001; Nooteboom, 2002, Edelenbos/Klijn, 2007).¶ Trust reduces the uncertainty about possible strategic reactions of other actors and thus reduces¶ transaction costs. It cannot always improve and enhance performance of cooperation but¶ does facilitate cooperation and solidify it (Edelenbos/Klijn, 2007).¶ If it is such a miracle instrument why isn’t it present all the time? There are several reasons¶ for this but an important one is that trust has to be created and sustained by interactions and¶ thus brings about interaction costs (other reasons: trust can be broken easily, takes a lot of¶ time to establish and is difficult to enforce). Table 6 gives an overview of the trust relations of¶ the main actors in the Delft case (identified by questionaires and interviews) and the interaction¶ frequency between actors.

# AT: AT

## AT-Frmk-1

**Our framework is a prerequisite to their political deliberation offense—Give no weight to their “fairness” claims because they assume an objectivity which is just a TROJAN HORSE for status quo political interests.**

**Voss and Bornemann 2011**

[Voß, J., and B. Bornemann. Technische Universität Berlin, Innovation in Governance Research Group, 2Leuphana Universität Lüneburg, Center for the Study of Democracy “The politics of reflexive governance: challenges for designing adaptive management and transition management” *Ecology and Society* 16(2): 9] Voss 11a

INTEGRATING POLITICS IN THE DESIGN OF REFLEXIVE GOVERNANCE How can limitations in current conceptions of reflexive governance be overcome? Building on the analysis of governance designs for AM and TM in the preceding sections, we now turn to pathways for further developing those designs. This is also relevant for integrating politics in the discourse on reflexive governance more generally. Starting from a diagnosed focus of AM and TM on the policy dimension and at the micro level of politics, we discuss two directions for further research and development. These can be depicted as a horizontal and a vertical movement within the framework introduced above (see Fig. 3). The horizontal movement refers to the conceptual inclusion of conflict and power struggle within arrangements of collective learning (micro politics) and to the development of specific institutional settings that are required to make sure that asymmetries of power and attempts at dominating and instrumentalizing the learning process for particular interests are counterbalanced (micro polity). The vertical movement refers to a perspective on governance design that systematically considers interactions with existing patterns of governance on a level of policy domains and political systems. Ecology and Society 16(2): 9 http://www.ecologyandsociety.org/vol16/iss2/art9/ Fig. 3. Routes for integrating politics in reflexive governance designs. Considering the Politics of Learning, Building Safeguards against Domination and Capture Both AM and TM build on an idealized image of cognitive learning that assumes unbiased observers of systemic changes, open-minded consideration of developmental options, and unequivocal interpretations of results from experimentation. Such a view neglects that experimental learning for sustainable development does not take place inside a scientific laboratory, somehow detached from immediate stakes and interests of actors, but in the real world where it is directly linked with ongoing processes of societal change (Groß et al. 2005, Rip 2006, Callon 2009). In a more or less direct way, experimenters with social–ecological or sociotechnical systems are themselves part of the experimental set up. Consequently, the framing, observation, and interpretation of sustainability experiments are highly reflexive exercises that affect identities, positions, and opportunities of individual actors. Whatever is being “learned” about sustainable development options in such arrangements has immediate implications for the possibility to continue certain lifestyles and business strategies or maintain positions of power, and thus entails high political stakes (Böschen and Weis 2007:169–171, Shove and Walker 2007: 766). Objectivistic models of scientific discovery (AM) or evolutionary selection (TM) appear problematic as they overlook the possibilities of strategic actors to shape or even to manipulate the set up and evaluation of experiments against the background of their own beliefs and interests (Meadowcroft 2009). The literature on policy analysis and evaluation (Braybrooke and Lindblom 1963, Stone 1988, Guba and Lincoln 1989, Lindblom 1990, Fischer and Forester 1993), environmental policy making (Hajer 1995, Hisschemöller et al. 2001), and technology and risk assessment (Wynne 1975, 1995, Stirling 2003, 2006) provides ample evidence of how knowledge production and politics intertwine. For sustainable development, these issues intensify with the complexity of debated phenomena and the focus on transformative changes (Thompson 1997, Funtowicz et al. 1998, Voß et al. 2007). Further development of designs for reflexive governance thus needs to take into account the politics of learning. A key task is to provide for safeguards against domination and instrumentalization by powerful groups. In the context of the framework set out above, this comes down to the integration of strategic interactions among conflicting societal perspectives (micro politics) and institutional provisions to calibrate and make political interactions productive (micro polity). Reflecting on adequate ways to work with conflict and power in the process of experimentation and learning is a necessary complement for coping with ambivalence, Ecology and Society 16(2): 9 http://www.ecologyandsociety.org/vol16/iss2/art9/ uncertainty, and distributed capacities in implementing sustainable development strategies. As conditions for deliberation and societal learning are controversially debated on a more fundamental level of social analysis and theory (Flyvbjerg 2001, Ryfe 2005, Parkinson 2006), we here identify a critical problem for the concept of reflexive governance more generally. Without claiming originality or comprehensiveness, we wish to hint at three possible search strategies that could be followed in meeting the challenge of politics of learning:

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## AT-Frmk-2

**Perm—Both frameworks are acceptable, which requires default to SUBSTANTIVE considerations of the political stakes of this debate—Instead of a single best interpretation, support rules that allow both kritiks and policy to coexist, compete, and learn from one another—Our interpretation solves their democratic deliberation offense better**

Voss and Bornemann 2011

[Voß, J., and B. Bornemann. Technische Universität Berlin, Innovation in Governance Research Group, 2Leuphana Universität Lüneburg, Center for the Study of Democracy “The politics of reflexive governance: challenges for designing adaptive management and transition management” *Ecology and Society* 16(2): 9] Voss 11b

A first strategy would aim for the exclusion of politics in order to create conditions of social interaction following Habermas’s concept of rational discourse (Habermas 1987, 1991). The goal would be to provide for reasoned arguments rather than interests, power, or any form of domination to bring about consensual problem definitions and solutions (Habermas 1987, 1991). Although such a strategy is implied in parts of the AM and TM literature, more thorough theoretical and conceptual work would be needed to devise specific procedural arrangements, rules for representative participation, and a certain cultural orientation of participants as institutional preconditions of a dominationfree discourse. l A second strategy would not seek to overcome particular views and interests for a new shared understanding of complex systems, but rather would seek to make diverging perspectives on those systems explicit and reflect on the stakes that are involved in conceptualizing dynamics, pathways, and experiments. Such a strategy could find orientation in Schön and Rein’s concept of “frame reflection” (Schön and Rein 1994). The goal would be to devise specific rules of procedure that enable participating actors to explain diverging understandings and conceptualizations of a given sustainability problem and reflect their particular views in relation to a diversity of others. Although this may not result in a unified strategy for dealing with social– ecological or sociotechnical change, it draws attention to a diversity of perspectives and related interests that are relevant and need to be accommodated, even if they are rationally incommensurable. Also, the challenge here lies with developing procedural arrangements that guarantee inclusive participation, basic equality among participants, and open communication. As there is no underlying drive to conclude on a shared view, inducements and opportunities for actors to try and dominate the learning process are less pronounced than in the first strategy.   l A third strategy, finally, would not aim at transforming political struggle into some kind of cooperative reflection, but seek to use political interests and strategies as a resource for exploring pathways of sustainable development. It would aim to stimulate public controversies that are driven by attempts of various interested parties to promote their particular views. Social learning, in such an approach, would not require enlightened participants to transcend their political interests, but it would be a result of strategic mutual adaptation within a field of discursive forces. Actors may, perhaps slowly and often secretly, pick up certain elements of each other’s perspectives if it helps them to defend a position and maintain public credibility (just as industry and conservative parties have come to adopt elements of environmentalists’ perspectives). The search for governance designs according to this strategy could find inspiration in concepts such as “partisan mutual adjustment” (Lindblom 1959, 1965) or ideas related to “controversy as informal technology assessment” (Rip 1987). A specific challenge along this route is to devise arrangements that support a broad range of social perspectives, as well as those of marginalized groups, to be publicly articulated and to engage in a pluralistic political debate. Compared with the first two search strategies, this third one does not only relate to designs for governance arrangements focusing on particular issues of sustainable development, but also to a more general challenge of nurturing and maintaining a vital democracy. This brief sketch of alternative search strategies suggests different ways by which the politics of learning could be integrated into the design of reflexive governance arrangements. They imply different concepts of learning that require specific directions for further conceptual work and practical Ecology and Society 16(2): 9 http://www.ecologyandsociety.org/vol16/iss2/art9/ experimentation with concrete designs. In any case, the crafting of detailed rules of procedure including methods of participant selection and process moderation is required to avoid domination and capture by powerful political interests. How this can be achieved may also be a question of particularities of the broader political context in which such designs are embedded.

## AT-Frmk-3

No internal link to their offense—Infrastructure planning does not occur as a rational, top-down process

Richard **Willson ’01** (*Department of Urban and Regional Planning, California State Polytechnic University*) p. 2 *“*Assessing communicative rationality as a transportation planning paradigm”

To properly explore these questions, the transportation field needs an intense dialogue about planning processes and a willingness to look at how transportation planning really works. This effort has been hampered by the fact that transportation planners and planning theorists generally ignore one another. Communicative rationality has not been reviewed in transportation journals; planning theory research seldom links to transportation planning. Furthermore, theory articles are often presented in language that is difficult to understand and disconnected from practice. In taking up these questions, therefore, I am seeking to foster a conversation between transportation planners and planning theorists, one that will improve the quality of transportation planning and add rigor to planning theory. There is tension between the formal process of planning based on scientific, instrumental rationality and the day-to-day reality of political bargaining and gamesmanship. One might argue, therefore, that a concern with transportation planning process is irrelevant, taking the view that real planning does not occur in formal planning processes, or in the preparation of plans, but through project entrepreneurship, bargaining and the exercise of political power. Transportation plans, then, either add sanction to what has already been decided or provide technical information that shifts the power among competing interests. I agree that this is sometimes the case, but if it is true that planning does not matter, it should not be that way.

## AT-Frmwk (fairness)

**A Subpoint: We control uniqueness: Three decades of kritiks means there is no such think as one presumed framework**

**B Subpoint: Rigid Rules create a False Sense of Stability—Kritiks are inevitable, and competing interpretations feeds an ILLUSION of predictable debate—This trades-off with ADAPTATION, the only reliable method for beating kritiks.**

**C. Subpoint: Turn: we are a SAFETY VALVE even if slightly unfair—Refusing our middle ground undermines system stability by encouraging polarization—Instrumental fiat versus Radical Project Debate.**

**D Subpoint: We uniquely increase THEIR adaptation: Forcing policy teams to defend how they interpret policy relevance is a prerequisite to beating kritiks.**

**J. B. Ruhl 1996**

[Assistant Prof at Southern Illinois University School of Law, “Complexity Theory as a Paradigm for the Dynamical Law-and-Society System” Duke Law Journal, Vol. 45, No. 5 (Mar., 1996), pp. 849-928]

the Surprises of Chaos, Emergence, and Catastro-   phe-Promoting Sustainability   in the Law-and-Society System   How do dynamical systems survive the onslaught of chaos,   emergence, and catastrophe, not to mention external happen-   stance? Some do not. Avalanches happen. Those   systems   that have   demonstrated   sustainability have somehow managed   to build into   their structures qualities   that help   them survive the   surprises pro-   duced by chaos, emergence, and catastrophe. This is not to   say   successful   systems do not experience chaos, emergence, or catastro-   phe, but only   that   they are not easily brought down by those phe-   nomena.   Recognizing that behaviors much like chaos, emergence, and   catastrophe occur in the law-and-society system model, how do we   deal with them? We can start by considering   the factors that con-   tribute to the robust   sustainability or fitness that allows some   dynamical systems   to withstand the   surprise phenomena-qualities   such as   stability, simplicity, and adaptability-that are themselves   in flux and tension in the most robust   systems. By stability, we   mean the quality   that allows relationships within the   system at any   one instant to remain close to the way they were the instant be-   fore." In the   law-and-society system,   for example,   it seems rea-   sonable to hope   that the   legal relationships affecting you will be   roughly   the same in the morning as when you went to bed the   night before. By simplicity, we mean allowing   the relationships   in   the   system   to be easily determined from the   system components   and   rules.98 For example, legal relationships   should be easily com-   prehensible. Lastly, adaptability   involves the ability   to respond   through   feedback and feedforward information flows to chaos,   emergence, and catastrophe (as well as nonsystem happen-   stance)." For example,   the   law-and-society system   should be able   to adapt   to challenges presented by new kinds of   socio-legal   issues.   Some of

the means and results of achieving   these goals may be    counterintuitive, just as dynamical systems frequently defy our   ordinary intuition.'" For example, stability   is not necessarily promoted by having   the   system adopt strong or rigid rules. The friction buildup between tectonic plates can be released   through a   series of small tremors over a period or one big earthquake at the   end of the period. The former approach   seems preferable, at least   for humans. So, too, can other dynamical systems, including   the   law-and-society system, preserve overall   system stability through   the use of built-in pressure relief mechanisms,.101  For example,   was the sudden introduction of CERCLA necessary, or would   gradual,   incremental measures directed at remediation of waste   sites have been more effective at producing a consensus-based,   lasting approach   to the issue of contaminated sites?

99. Feedback is "[a] general   term for the mechanism whereby   the consequences of   an ongoing process become factors in modifying or changing   that process." COVENEY &   HIGHFIELD, supra note 4, at 427. Feedforward involves "[n]etworks whose architectures   are such that the neurons can be divided into   layers, with the neural activities in one   layer only being able to influence the activity   in later   (not earlier) layers." Id. *Adapt-   ability   is associated with   system   feedback and feedforward   loops   that "enable the   system   to restructure, or at least modify,   the interaction pattern among   its variables, thereby   opening up   the possibility   for a wider range of behaviors." CASTI, supra note 7, at 271.   Hence, "[a]daptive behavior is an emergent property which   spontaneously arises   through   the interaction of simple components." GLEICK, supra note 7, at 339 n.314   (citation omit-   ted). As such, adaptability, stability, and   simplicity   in   systems are in tension, a necessary   quality of robust systems: Emergence   is necessary   to produce adaptability, but the chaos   that comes along with it is held in check by stability and   simplicity. See generally infra   notes 101-08 and accompanying   text  Similarly, simplicity   is not necessarily promoted by adopting   uncomplicated system rules. For example, what could be more   simple   to comprehend   than a rule allowing everyone   to drive   sixty   miles per hour anywhere at all times? Such a rule could result in   chaotic   (probably dangerous) driving behavior if applied   to heavy   traffic in a downtown   setting. If, however, all drivers had to use   the same one-lane road,   it wouldn't matter very much what the   speed rule   says-the slowest driver would set the pace. Congress   chose a   simple rule-discarded material-to define solid waste, and   EPA* handed us a regulatory maze."' Congress might have pro-   vided a more "complicated" legislative directive that,   in a more   controlled, simplified administrative   setting, could have produced   more   simple, comprehensible implementation regulations.

Lastly, adaptability does not necessarily come by responding   directly   to emergent phenomena with precisely   tailored counter-   vailing rules. *Emergence manifests itself at high system   levels and   is the result of interactions   taking place at lower   system   levels.   Change   the dynamics at lower system   levels and the emergent   behaviors change. Hence,* systems   that rest on flexible, adaptive   lower   system dynamics have a better chance of   surviving higher   level complexities. For example,   the chasing-the-pollution history   of the CWA, CAA, and RCRA'03   involved   legal   initiatives   aimed at confronting high system   level emergences-pollution   disposal-head on with countervailing regulations. Only recently   has environmental law shifted attention one level lower to pollu-   tion prevention measures.'" Fully   successful pollution prevention   would negate much of the need for pollution disposal control and   would allow us to respond   to instances of pollution at their sub-   surface causal level rather than the surface manifestation   level.o?5   Similarly, creating   incentives for landowners to view conservation   as being more attractive than development, rather than   fueling   the   "race to develop"   fire with more regulations, could ameliorate the   race to develop by reducing   the   tendency   to produce   the emergent   behavior feedback and feedforward cycles.   Dynamical systems theory   thus teaches us some counterintui-   tive lessons for promoting system sustainability. First, focus on   system mechanisms that will serve as   system "release valves."   Second, focus on   simplifying   the   system dynamics, not necessarily   just   the system rules. Finally,   focus on promoting system adaptability through   innovation of lower-level system dynamics, not on   mechanisms designed   to confront high-level emergent complexities   head-on. The unifying   theme of those lessons is that it is not   just   the rules of the   system   that matter but the entire   system   structure.   Hence, legal reform directed at the goals of   increasing system    adaptability must focus on working with the complete   law-and-   society system, not on   just tinkering with laws.

So, toward what paradigm   should a dynamical system be con-   structed to achieve sustainability? This is where we find dynamical   systems theory-through   its complexity theory branch-pulling   the   pieces of the puzzle together.'" As noted in the previous   section   describing   the various   types of   system attractors, dynamical sys-   tems theorists have explored a region exhibiting system behavior   known as complexity.'" This region   is sandwiched between the   periodic and chaotic states, and is defined by systems possessing a   blend of fixed point,   limit cycle, and chaotic attractors. The re-   search of this region reveals that the closer such a   system can get   toward the chaotic state without "falling in," the more adaptable   the   system   is to the   surprises produced by chaos, emergence, and   catastrophe. Complexity behavior,   it appears, promotes system   sustainability. Why   is this so?

The answer lies in the nature of behavior that is associated   with each   type of attractor and in the balance'" that can be   achieved for overall   system behavior by blending   the influence of   certain attractors. The only type of attractor that responds unpre-   dictably   in the   long   term to small changes   in   system components   is   the   strange attractor, which produces deterministically random   (chaotic) behavior. A   strange attractor remembers, so to speak,   that the   system was perturbed   in the past, and it responds by   changing trajectory   to adapt   to the perturbation. Fixed point and   limit cycle attractors, by contrast, do not allow such computation   and alteration of   trajectory.?" On the other hand, fixed point   and limit cycle attractors present more predictable behavior, and   therefore contribute stability and   simplicity   to the   system.    Strange attractors thus are necessary   for   system adaptation   to   take place, but fixed point and limit cycle attractors, because of   their predictability, make possible extended system-wide stability   and   simplicity. Complexity theory research has revealed that the   key   in determining   the blend of attractors is the degree   to which   system components depend on one another for knowing where to   go next on the   trajectory, and that there is "this completely deci-   sive property of complexity,   that there exists a critical size below   which the process of   synthesis   is degenerative, but above which   the phenomenon of   synthesis    can become explosive.""'1 ...

When the degree of   interdependence, or coupling, among   the   system components   is sufficient to allow the three   types of   attractors to blend in the correct measures, optimal system adapt-   ability   therefore is achieved. That optimal system adaptability   occurs in the   region called complexity. Too many   fixed point and   limit cycle attractors drag   the   system   into stasis. Too many strange   attractors drag   the   system   into chaos. Just the right blend of   attractors keeps   the   system "on the edge" of chaos, capable of   sustaining   the   surprises produced by chaos, emergence, and catas-   trophe as well as by   the happenstance of forces external to the   system.   In short, "complex systems constructed such that   they are   poised on the boundary between order and chaos are the ones   best able to adapt by mutation and selection. Such poised systems   appear   to be best able to coordinate complex,   flexible behavior    and best able to respond   to changes   in their environment.""' Sys-   tems in the complex region   thus exist when the qualities contrib-   uting   to   system sustainability-stability, simplicity, and adaptabili-   ty-are   in harmonious balance, and chaos, emergence, and catas-   trophe are collapsed   into instruments of   system evolutionary ro-   bustness.   The great paradox of dynamical systems   that complexity   theo-   ry has unlocked, therefore, is that "equilibrium"   in the classical   science sense of stasis and   linearity   is not sustainable in the   long   term for dynamical systems. Rather, strange attractors are a key   ingredient of robust   systems, and thus some level of chaotic behav-   ior is necessary   to maximize   system sustainability. Moreover, the   blend of attractors needed to promote sustainability necessarily   produces emergent behaviors as a result of interaction between the   multiple components. Hence, a robust, fit, sustainable dynamical   system, because of the inherent presence of some chaos and emer-   gence, necessarily   is unpredictable. The key   is that the complex   systems have turned that source of unpredictability around and   channeled it into the trait of adaptiveness, allowing   the   system   to   transform disorder into organization. To find that level of   sustainability,   the   law-and-society system also must evolve12 to-   ward the complex region,   so as to sit "on the edge of   chaos."

## AT-Reps/Discourse Irrelevant

**All policy decisions and disagreements stem from a frame of ‘reality’. Only breaking their reductionist frame allows better policy.**

**Lowe, 2011** [Kate Lowe. PhD at Cornell University. Neighborhood, City, or Region: Deconstructing Scale in Planning Frames. Berkeley Planning Journal 24(1). 2011]

Frames are conceptual and discursive schemata that shape our perceptions¶ of reality and policy issues. In a world of unlimited data and information,¶ frames selectively direct one’s attention to some pieces of information¶ and color how we interpret them. George Lakoff (2004) argues the¶ political right’s use of frames affects how the public understands issues.¶ The phrase “tax relief” is one of his examples. Relief conjures affliction¶ and “a reliever who removes the [tax] affliction…is therefore a hero.¶ And if people try to stop the hero, those people are villains for trying to¶ prevent relief” (p.3).¶ In policy studies and planning, Schön and Rein (1994) explain that actors¶ may reframe “intractable” issues through reflective practice and codesign¶ of policy solutions. Disagreements in policy processes may not¶ simply be about desired actions, but result from tacit, conflicting frames¶ defining the “problem” (Valve 1999). Frames are socially constructed¶ and actors always see the world and phenomenon from their particular¶ positions. Thus, frames cannot be proven or disproven nor correct or¶ incorrect (Schön and Rein). Schön and Rein provide several examples¶ of reframing in policy processes, including homelessness programs in¶ Massachusetts. Initially, state agencies “saw housing as a scare resource”¶ (p.141). Underlying the state’s approach was the “core idea of the market¶ frame” (p. 142). In this frame, “the state’s first response to market failure¶ should be restorative. In the case of housing, the state may restore markets¶ by supporting the supply of housing…and/or the demand for housing¶ exerted by low-income and homeless families” (p. 142). Meanwhile,¶ advocates framed housing as a legal entitlement. By focusing on the¶ perverse incentives in the state’s homelessness programs and using the¶ metaphor of “closing the front and back doors,” stakeholders were able¶ to reflect on and programs and hence redesign them successfully.¶ Because actors identify problems and solutions through frames, frames¶ can have policy effects and thus warrant analysis. Policy frames and¶ stories construct problems and identify solutions (Schön and Rein 1994).¶ For example, Richardson, Isaksson and Gullberg (2010) consider the¶ frames through which policy makers have created congestion strategies¶ for Stockholm. They find some shifts in attitudes toward the private¶ car and the persistence of a “car-based automobility frame” and a¶ goal for “ever increasing mobility.” Because of these guiding concepts,¶ Neighborhood, City, or Region 49¶ implementation measures (including a “radical” congestion tax) aim to¶ control congestion and manage infrastructure systems efficiently, rather¶ than reduce the number of vehicle miles traveled.¶ Recent literature has emphasized the dynamic and continually (re)¶ constructed nature of frames. For example, Fischer (2003) studies (re)¶ framing as a process, rather than as distinct frames. Likewise, Tennøy¶ (2010) adapts Schön and Rein’s work to describe framing as: “a way¶ of selecting, organizing, interpreting and making sense of a complex¶ reality to provide guideposts for knowing, analyzing, persuading and¶ acting. Framing will thus inﬂuence how a problem is understood, the¶ means and strategies that are considered, the analyses and tools that are¶ chosen, etc.” (p.218). I understand frames as a momentary product of the¶ ongoing process of framing, undertaken by multiple actors and drawing¶ on durable but dynamic concepts and structures. My distinction between¶ frames and framing is somewhat artificial, but it allows for a simplified¶ illustration of scale in issue frames.

## AT-Reps/Discourse Irrelevant-2

**Transportation policy disourse must be evaluated first—methods of communication shape the reality of transportation planning.**

Willson 1

[Richard Willson, Department of Urban and Regional Planning, California State Polytechnic University, “Assessing communicative rationality as a transportation planning paradigm”, Transportation 28: 1–31, 2001]

Abstract. Communicative rationality offers a new paradigm for transportation planning. Drawing on the literature and lessons from transportation planning practice, this paper describes the characteristics of a “communicative” form of transportation planning and compares them with conventional practices. A communicative rationality paradigm would place language and discourse at the core of transportation planning. The paper argues that it would lead to greater attention to desired transportation ends (goals), better integration of means and ends, new forms of participation and learning, and enhanced deliberative capacity. The paper explains the implications of this paradigm for the role of the transportation planner, the purpose of planning, the planning process, communicative practices, problem framing, and the nature of planning analysis. The paper concludes with an assessment of communicative rationality’s ability to promote more effective transportation planning. It seeks to create a dialogue that will support the investigation of new transportation planning processes.¶ Introduction¶ Transportation planners use language as if it mirrors the world. If language is a mirror, then, it is a neutral tool in the service of communicating information. In most transportation planners’ minds, language describes objective conditions, explains methodologies and expresses values. Numbers, moreover, are a precise form of language that provide unambiguous representations of reality. Are not measures of vehicle flows, level of service or cost effectiveness robust representations of reality? Gridlock is gridlock, right?¶ For planning, however, gridlock is not gridlock until we have defined it as a problem and decided to do something to address it. Transportation plans depend on what gridlock means, and establishing meaning is an inherently social and linguistically based process. The way that transportation planners use language – understanding certain ideas and values and excluding others, hearing some things and not hearing others, and defining roles for themselves, their organizations, decision makers and the public – shapes knowledge, public participation, problem definition, process design and negotiation, and the outcome of planning. The perspective offered in this paper is that language profoundly shapes our view of the world.¶ The paper critically examines the formal scientific rationality that dominates the field and uses insights from planning practice, social theory and philosophy to explore the promise of communicative rationality as a new paradigm for transportation planning – one in which language and communicative processes form the basis for rational planning. Innovative forms of transportation planning based on theories of communicative rationality hold the promise of solving some of our most difficult transportation planning problems.¶ The global aim of communicative rationality is to create a rational basis for constructing ends and means in a democratic society, by enriching public and political discourse. Communicative rationality focuses on interactive processes rather than the deliberative process of a single actor, emphasizing the design of planning processes, participation and learning, and a reconciliation of different ways of understanding planning opportunities. It reorients planning from a form of scientific, instrumental rationality to a form of reason based on consensual discussion.1¶ Alexander (2000) argues that there are many forms of rationality – communicative, instrumental, strategic, and so on – and that the real question is appropriately matching the form of rationality to the planning circumstance. This paper takes a different approach, anticipating a paradigm shift that will radically change the basis of knowing and the process for making transportation planning decisions. Kuhn (1970) explains that such shifts only occur when contradictions in the predominant paradigm become great and a new, more useful paradigm is compelling. The reader is invited to consider his or her own practice to conclude whether the preconditions for a paradigm shift in transportation planning are present and whether communicative rationality will be the new transportation planning paradigm.¶ To properly explore these questions, the transportation field needs an intense dialogue about planning processes and a willingness to look at how transportation planning really works. This effort has been hampered by the fact that transportation planners and planning theorists generally ignore one another. Communicative rationality has not been reviewed in transportation journals; planning theory research seldom links to transportation planning. Furthermore, theory articles are often presented in language that is difficult to understand and disconnected from practice. In taking up these questions, therefore, I am seeking to foster a conversation between transportation planners and planning theorists, one that will improve the quality of transportation planning and add rigor to planning theory.¶ There is tension between the formal process of planning based on scientific, instrumental rationality and the day-to-day reality of political bargaining and gamesmanship. One might argue, therefore, that a concern with transportation planning process is irrelevant, taking the view that real planning does not occur in formal planning processes, or in the preparation of plans, but through project entrepreneurship, bargaining and the exercise of political power. Transportation plans, then, either add sanction to what has already been decided or provide technical information that shifts the power among competing interests. I agree that this is sometimes the case, but if it is true that planning does not matter, it should not be that way.¶

## AT-Science/Empiricism Good-1

**Turn: Rejecting their linear oversimplifications is a prerequisite to effectively integrated policy and rigorous empirical knowledge.**

**Manson 2007**

[Steven M Manson: Department of Geography, University of Minnesota, “Challenges in evaluating models of geographic complexity” Environment and Planning B: Planning and Design 2007, volume 34, pages 245 ^ 260] Manson 10

This is an exciting time to be performing geographic complexity research. Complexity methods and concepts are maturing and geographic research, particularly as incar- nated in GISc, is rapidly expanding.Whilst adopting and adapting complexity concepts and methodologies, complexity researchers that actively engage with concepts of place and space are sculpting the larger complexity research agenda. They are also beginning to offer unique insight into methodological issues, such as sensitivity and complex scale; conceptual challenges of conflating pattern and process, and reconciling simplicity and complexity; and policy issues posed by the science ^ policy gap and postnormal science. More can be done, however, as meeting these challenges requires broader strategies for calibrating, verifying, and validating models of geographic complexity. The interplay between system sensitivity and metastability defines scale limits in model evaluation. Interdisciplinary research with a distinctly geographic cast supports triangulation among, and replication of, varied approaches. Better communication of geographic- complexity methods and theory within the science and policy communities will lead to better model evaluation. In broader terms, we must appreciate and accommodate the limited extent to which models can answer certain questions about complex systems. Even if scientists could somehow deliver unequivocal technical and scientific answers to questions posed by issues such as global environmental change, there will usually remain transscientific aspects of these issues that require a political component to answer the moral or ethical questions, and the rubric of model evaluation can help frame the answers.

## AT-Science/Empiricism Good-2

**We are a prerequisite to proper application of empirical knowledge to policy—Classic deterministic models fail when confronted with the unpredictability of economic and ecological systems.**

Jesus **Ramos-Martin 2003**

[Departament d'Economia i d'Història Econòmica, Institut de Ciència i Tecnologia Ambientals, Universitat Autònoma de Barcelona, “Empiricism in ecological economics: a perspective from complex systems theory” [Ecological Economics](http://www.sciencedirect.com/science/journal/09218009) [Volume 46, Issue 3](http://www.sciencedirect.com/science?_ob=PublicationURL&_tockey=%23TOC%235995%232003%23999539996%23463070%23FLA%23&_cdi=5995&_pubType=J&view=c&_auth=y&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=f3f02a77893242cfe42ee42d054a6790), , Pages 387-398]

Abstract

Economies are open complex adaptive systems far from thermodynamic equilibrium, and neo-classical environmental economics seems not to be the best way to describe the behaviour of such systems. Standard econometric analysis (i.e. time series) takes a deterministic and predictive approach, which encourages the search for predictive policy to ‘correct’ environmental problems. Rather, it seems that, because of the characteristics of economic systems, an ex-post analysis is more appropriate, which describes the emergence of such systems’ properties, and which sees policy as a social steering mechanism. With this background, some of the recent empirical work published in the field of ecological economics that follows the approach defended here is presented. Finally, the conclusion is reached that a predictive use of econometrics (i.e. time series analysis) in ecological economics should be limited to cases in which uncertainty decreases, which is not the normal situation when analysing the evolution of economic systems. However, that does not mean we should not use empirical analysis. On the contrary, this is to be encouraged, but from a structural and ex-post point of view.

1. Introduction

Ecological economics deals with, and is related to, policy generation and, in order to do this needs numerical data about both human and natural systems. It is the goal of this paper to analyse the role of empiricism in the framework of neo-classical environmental economics and ecological economics. After doing that, the paper defends a phenomenological and ex-post analysis to deal with the complexity of modern economies, by giving some examples of empirical work already done under this view.

The concepts underlying ecological economics and neo-classical environmental economics will be outlined, to emphasise that the latter makes some strong implicit assumptions about the working of systems under its analysis (i.e. economic systems). These assumptions are compatible neither with the main characteristics of present complex environmental systems nor with the nature of economies. This is why ecological economics deals with both the problems and the systems in an alternative way.

The structure of the rest of the paper is as follows: [Section 2](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#sec2) focuses on the conceptual structures in ecological economics and in neo-classical environmental economics from an evolutionary perspective based on the concept of time. [Section 3](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#sec6) presents the debate about the role of policy for sustainability purposes. [Section 4](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#sec7) presents the position of these two schools of economic thought on empirical analysis, focusing on time and evolution. With this background, [Section 5](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#sec8) mentions some of the latest developments in empirical analysis that have been published in the field of ecological economics, and that are an example of what could be empirical analysis when dealing with complexity in ecological economics. Finally,[Section 6](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#sec9) reaches the conclusion that a predictive use of econometrics in ecological economics should be limited to cases in which uncertainty decreases. This leads to presenting the way ahead regarding empirical analysis in ecological economics, and its relationship to policy formulation.

2. Conceptual structures in ecological economics and in neo-classical environmental economics

2.1. Neo-classical economics

Neo-classical economics focuses on the exchange of goods and services among the economic agents, such as consumers and producers, emphasising the role of consumer preferences and resources endowments, to guarantee the economy's equilibrium. As pointed out by [[Ruth, 1993](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib40)] the main characteristics of this approach are a concentration on market mechanisms, a focus on microeconomics instead of macroeconomics, static analysis (neglecting then the history of processes), linearity, and a consideration of the environment only as a given boundary. This means that the methodology developed by neo-classical economics, general equilibrium theory, guarantees the achievement of a solution in the allocation of scarce resources ( [[Faber et al., 1996](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib8)]).

To understand better neo-classical economics we might think that it follows classical mechanics in its description of the economic process. That is, production, consumption, or distribution are seen as single processes that can be analysed separately to achieve not only understanding of them, but also to make possible forecasting. In the words of [[Georgescu-Roegen, 1971](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib12)] (p. 319), it “is a mechanical analogue”. As in mechanics, economists are seeking “universal laws” that can be applied everywhere and regardless time. Once laws are defined and basic principles or axioms are accepted, then this economics must be a theoretical science, deductive, and deterministic, capable of finding unique optimal solutions.

Since neo-classical economics follows mechanics, where all processes are reversible, its equations and models are also ‘time symmetric’, where time is just a cardinal magnitude, which can, therefore, be added or subtracted ([[Beard and Lozada, 1999](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib1)]). At this point it is worth mentioning Georgescu-Roegen's distinction between ‘time’ and ‘Time’. Using his own words (1971, p. 135), “*T* represents Time, conceived as the stream of consciousness or, if you wish, as a continuous succession of “moments”, but *t* represents the measure of an interval (*T*′, *T*″) by a mechanical clock” (emphasis in the original). Neo-classical economics claims the theory to be valid in all societies, that is, to be a-historic, because they are considering mechanical time, instead of historical Time. This distinction is relevant since it is related to Prigogine's ([[Nicolis and Prigogine, 1977](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib26)and [Prigogine and Stengers, 1984](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib31)]) Second Arrow of Time, which in words of [[Proops, 1983](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib32)] (357), is “the tendency of certain systems to become more complex and more structured”.

Neo-classical natural resource and environmental economics, deals with the environment by analysing the threats of scarcity and pollution using the ideas described above. The methods developed have been: (i) optimisation in the case of managing natural resources (either renewable or exhaustible), and (ii) assigning property rights on pollution (or more generally externalities) in order to incorporate them into the price system, and thus, in the decision process under the market mechanism. This is why supporters of this approach are usually optimistic when dealing with environmental problems. For example, in the case of exhaustible resources they propose substitution between production factors, neglecting two basic issues. On the one hand, there are services provided by nature that are not substitutable at all (like the water or the carbon cycles). On the other hand, “from a physical perspective substitution cannot replace energy completely (including the energy of labour) because each factor of production depends ultimately on an input of net energy for its own production and maintenance” ([[Hall et al., 1986](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib18)], p. 46). It could be added that we can interpret the relationship between energy and matter, or any kind of production factor, as largely that of complementarity rather than substitutability.

All of these characteristics of neo-classical economics, and its environmental branch, led to it being viewed as having difficulties dealing with new and complex problems, such as environmental problems. As [[Clark et al., 1995](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib3)] pointed out, the mechanical character of economic models does not allow them to treat evolution or structural changes in the system. This fact led to new approaches as those proposed by ecological economics.

2.2. Economies as complex adaptive systems

Economies are complex adaptive systems, that is, composed of large and increasing number of both components and of the relationships between them. Economies are also teleological systems (they have an aim, or end, the telos), but in a different way than non-human systems, which have only that of self-maintenance and development of the systems; economies incorporate new tele, those of the human beings belonging to the system, and they are capable of incorporating the guessed consequences of their fulfilment into the present decisions and definitions of new tele; they are thus anticipatory. They also learn from mistakes and from present developments, and they react, by changing both the actions undertaken and the tele defined; they are thus self-reflexive. They also have the ability to adapt to new changing boundary conditions (a property also shown by non-human systems), but they may consciously alter the boundary conditions. This is why the economy, as a human system, can be understood as a complex, adaptive, self-reflexive, and self-aware system (see [[Kay and Regier, 2000](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib22)] for more details).

When analysing their structure, economic systems are nested hierarchical systems. In the case of economic systems, we can distinguish several subsystems within them, and every sector may be split into different industrial ‘types’ (sharing common features) and so on. The various levels of an economy exchange human activity and energy between them, reflecting the interconnected nature of those systems (the output of one sector enters other sector as input, and vice versa). That is, “downward and upward causation imply feedback between different levels of description in the hierarchy (…) [then], in mathematical terms it implies additional complexity and non-linearity such that an economic equilibrium is no longer evident and certainly cannot be easily calculated” ([[Van den Bergh and Gowdy, 2003](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib44)]).

Thus, the increased complexity of economies, their nested hierarchical nature, and the fact that they show adaptive and evolutionary behaviour, gives rise to two parallel outcomes. One is the non-linear behaviour, even chaotic behaviour that these systems show. This is a short run process that involves a given structure and the difficulty in comprehending it by using the traditional methods of analysis based on hard (quantitative) modelling. The other is the emergence of novelty, which is long run, and involves changes in the structures. An alternative way of presenting this is by using the concepts of phenotypic evolution (different realisations of potentialities of the systems, which are susceptible of prediction) and genotypic evolution (emergence of new institutions or techniques, which by definition are unpredictable; that is, new potentialities) ([[Faber and Proops, 1998](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib7)]). Therefore, they are contextual by nature, depending on one particular space and time scale, and so they have to be analysed, taking one specific time and space scale into account. Since the parameters do change, this fact brings uncertainty up to the scene in the form of the selection of the set of parameters to be used to characterise the structure of the system. That is, the question of who decides the set of parameters is relevant here. Moreover, because of the same characteristics, and because being anticipatory systems means that they incorporate possible future states into the present, there may be multiple equilibria.

If this is the case and we cannot find regularities or periodicity in the evolution of the systems, they would be largely unpredictable. This is so because when the system suffers a sudden change that makes it move away from one attractor point to other thanks to a random fluctuation, a small change in the parameters may have large consequences ([[Gleick, 1987](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib15)]). This is the so-called Butterfly Effect, later called ‘sensitive dependence on initial conditions’. If this is happening, then very small influences can no longer be neglected; this makes modelling and prediction hard. In this sense we must consider the future to be open and uncertain under a non-linear world ( [[Haken and Knyazeva, 2000](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib17)]).

However, this chaotic behaviour gives rise to new ordered structures within systems that can be approached from complex systems theory. In the words of [[Haken and Knyazeva, 2000](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib17)] (p. 59), “although the future is open, and there are a number of possible evolutionary ways for a complex system, not any arbitrary (either conceivable or desirable) evolutionary way is feasible in a given system”. This is so because history counts and once a path is taken, some others are closed forever (i.e. path dependency). This reduces the number of possible attractors, and it induces, again, non-linear behaviour in the development of the system. It also reflects irreversibility. One of the ways of improving the knowledge in that context is by finding historical regularities that may reflect the emergent properties of the systems. However, we have to bear in mind that even if some regularities are found, there might not be any causal relationship between the processes or variables. Even, “it is also possible that *no* regularities will appear despite the existence of causal relations between the factors being studied” ([[Ramsay, 1998](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib36)], p. 168, emphasis in the original).

Thus, even though the future is open, only some of the evolutionary paths are feasible and can develop, giving rise to different attractors. [[Haken and Knyazeva, 2000](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib17)] put it in these terms, “only the structures being in accordance with the inner evolutionary trends of the systems can arise. And nothing else but select meta-stable structures can be constructed in the system. These are a kind of *evolutionary laws of prohibition*” (emphasis in the original). These laws tell us that we cannot have equilibrium, and that the meta-stable structure has to be compatible with the internal constraints of the system. However, contrary to neo-classical economics, these do not tell us anything about what kind of systems or solutions we are going to have.

2.3. Ecological economics

Ecological economics takes production, or the transformation of energy and materials, as one of its focal points, as it was done by classical economic thought, but it uses in its analysis the insights derived from thermodynamics, i.e. the second law of thermodynamics that introduced the issue of irreversibility. It is, then, an evolutionary science. An evolutionary science deals with historical events, and the processes between the events; that is, it deals with the issue of time. Using Georgescu-Roegen's distinction about time, it can be said that an evolutionary science deals with historical ‘Time’, whereas neo-classical economics deals with mechanical ‘time’, so neo-classical economics cannot be considered as an evolutionary science.

Ecological economics also deals with new complex adaptive systems, as presented above. Ecological economics, thus, unlike neo-classical environmental economics, focuses, among other things, on evolution of economies, on the process of becoming, on structural change, and the emergence of novelty (in the form of technological change, for example), all features shown by complex adaptive systems. The presence of novelty, the feedback mechanisms between the different levels of the hierarchy, and their anticipation, ensure that uncertainty is always present when dealing with these systems. This is one reason to ask for a new epistemology, as it is done in the next section. In fact, the more research we apply, the more uncertainty is generated, new questions arise, and new relationships between variables are found. In words of [[Faber and Proops, 1998](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib7)] (p. 110) when talking of environmental problems, “very often they involve the emergence of unpredictable events (novelty) (…) this implies that the simple sequence of problem→science→technique→solution is not necessary valid. On the contrary, we experience that our increasing knowledge may even impede the investigation for solutions”. This fact causes the issue of unpredictability, very often present when analysing environmental problems, and therefore, relevant for ecological economics, and especially for policy generation.

3. The role of policy

In economics, the role of policy is viewed differently depending on the school of thought taken. Neo-classical environmental economics conceives of the existence of policy based in economic analysis. It analyses market failures that induce environmental externalities, and tries to design policy to ‘correct’ these failures, and eventually give optimality. To do that, it uses the tools explained before in [Section 2.1](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#sec3).

However, the new environmental problems are characterised by the following traits: facts are uncertain, there are values in dispute, the stakes are high and decisions are urgently needed ([[Funtowicz and Ravetz, 1991](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib10)]), as we saw in [Section 2.2](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#sec4) when dealing with complex economies. In this context, ecological economics defends a new epistemology to deal with complexity. So, in this context dominated by uncertainty and ignorance (we do not know what we do not know), a new approach to tackle these problems is needed. This approach has been called “poststructural” or “post-modern” ( [[Denzin, 1994](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib5)]), “civic science” ( [[O'Riordan, 1996](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib27)]), or “post-normal science” ( [[Funtowicz and Ravetz, 1991](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib10)]). Ecological economics is said to be an example of post-normal science ( [[Funtowicz and Ravetz, 1994](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib11)]).

In this approach it is not said that present scientific knowledge is no longer valid or applicable, but rather, that there exist some emergent problems characterised by complexity and uncertainty in which the “normal” science can not be used with the traditional methods alone (i.e. the sequence of problem→science→technique→solution mentioned above).

In post-normal science it is admitted that objective reality can never be captured because of the inherent changing characteristics of the systems analysed, and that research is influenced by values of the researcher and, therefore, there is no value-free science ([[Denzin and Lincoln, 1994](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib6)] [[Prigogine and Stengers, 1984](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib31)]). With this background, policy-making becomes a multidimensional and multifaceted process ( [[Rist, 1994](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib37)]) in which research is only one source of knowledge among others (such as common sense, beliefs, etc.) that seek to influence the final result.

In post-normal science, research and knowledge have not the intention of providing policy-makers with a solution to the problem avoiding the need for them to take the political decision, and legitimating all of their acts. Rather, the idea is to create a shared contextual understanding about the issue ([[Rist, 1994](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib37)]) in such a way that we keep informed all of the actors involved in the process of decision-making, but letting them reach a satisfactory compromise solution. This compromise solution will not have the aim of being a reflection of ‘truth’, but rather it will be a socially constructed view of reality ( [[Clark et al., 1995](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib3)]), an agreed understanding of both the problem and the ways of tackling it.

As [[Kay et al., 1999](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib23)] (p. 737) said, “The program of post-normal science is to provide a basis for the understanding necessary to unravel complexity (emergence, irreducible uncertainty, internal causality), so that we may successfully anticipate, when possible, and adapt, when appropriate or necessary, to changes in the self-organising systems of which we are an integrated and dependent part”.

Post-normal science is, thus, about assuming that in both science and the process of decision-making there exist value judgements, and it is proposed, therefore, that we have to guarantee the quality of the process of decision-making rather than the final result, because there is no objective truth ([[Funtowicz and Ravetz, 1994](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib11)]). To do that, we should shift from a substantive or result-oriented rationality to a new procedural rationality ( [[Simon, 1983](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib41)]), in which the process of knowledge generation is the relevant issue instead of the focus being on the final outcome. Such procedural rationality would imply an extension of the peer review community to people from other disciplines and to people affected by the issue. The work would be to manage the uncertainty that characterises every field to get the highest quality information we can achieve ( [[Funtowicz and Ravetz, 1994](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib11)]). “This extension of the peer community is essential for maintaining the quality of the process of resolution of problems of reflexive complex systems” ( [[Martínez Alier et al., 1998](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-49MF181-3&_user=108429&_coverDate=10%2F31%2F2003&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_searchStrId=1658541291&_rerunOrigin=scholar.google&_acct=C000059713&_version=1&_urlVersion=0&_userid=108429&md5=c3a729c65d5c068d35498ac3859ea4bc&searchtype=a#bib25)], p. 282).

In sum, in ecological economics, as a post-normal science, policy is thus seen as a social steering mechanism implying the need to engage all stakeholders in reaching consensus.

## AT-Science/Empiricism Good-3

**Complexity is a prerequisite to integrating empirical knowledge into transportation policy**

**Manson 2007**

[Steven M Manson: Department of Geography, University of Minnesota, “Challenges in evaluating models of geographic complexity” Environment and Planning B: Planning and Design 2007, volume 34, pages 245 ^ 260] Manson 3

2.2 Geographic complexity

Geographic complexity may be defined as research that combines complexity science with geographic concepts (space and place) and uses modeling as a key mode to examine systems spanning multiple spatial, temporal, and societal scales. Complexity research increasingly uses concepts of space and place (see Byrne, 1998; Cilliers, 1998; Lissack, 2001; Manson, 2001; Reitsma, 2002; Urry, 2003). We term these `geographic' without implying that they are the sole province of the discipline of geography, much as the journals Economic Geography and Journal of Economic Geography are associated with geography and economics, respectively. In terms of geographic research, there is fruitful collaboration between GISc and complexity, although there is also crossover between qualitative and quantitative complexity research.

Geographic complexity spans a range of substantive areas, takes an explicitly inter- disciplinary cast, and examines systems spanning multiple spatial, temporal, and societal scales. Though complexity sprang from the union of computer science, physics, biology, and economics (Lewin, 1992), it has quickly become interdisciplinary. Geo- graphic concepts, and GISc in particular, are similarly embraced by a variety of disciplines interested in explicitly combining complexity with geographic concepts of place and space. These range from public health (Gatrell, 2005) to ecology, environ- mental biology, and climatology (Brose et al, 2004; Phillips, 2003; Rind, 1999; Roy et al, 2003), through to anthropology, economics, regional science, and sociology (Arthur, 1999; Batten, 2001; Dean et al, 2000; Sampson et al, 2002). This interdisciplinary focus allows complexity and GISc to model complex spatiotemporal phenomenaösuch as those that exemplify global environment change and land changeöwhich exhibit characteristics such as nonlinearity, self-organization, deterministic chaos, and path dependence (Parker et al, 2003; Rind, 1999).

2.3 Geographic complexity and model evaluation

Complexity research relies on modeling as its de facto epistemology (O'Sullivan, 2004). Complexity scientists have implicitly adopted the `semantic conception' of the relationship between theory, models, and reality (after Henrickson and McKelvey, 2002). As per figure 1, the classic view of science is termed the axiomatic conception of science, which holds that theory leads to testable models evaluated against reality. Less rigid and of broader applicability is the normal-science conception [applied to organizational science by McKelvey (1999)], in which theory and reality are linked by human observers in addition to being understood through the use of models. Complex- ity scientist, however, have implicitly adopted the semantic conception of science, whereby models intermediate reality and theory. In other words, for complex systems, the linkage between reality and theory can be made only through computational modeling because this is the only means of capturing the complexity of both. Though this tight theory ^model ^ reality linkage exists for a variety of reasons (Henrickson and McKelvey, 2002), most important for this discussion is the fact that we understand complex systems with models (figure 2). Model evaluation is a necessary focus for understanding and meeting the challenges faced in geographic complexity research. Evaluation is the means by which models test competing visions of the relationship between complex reality and complex theory. Evaluation is a general term for model calibration, verification, and validation, which involve, respectively: specifying or fitting a model; ensuring that it functions and is internally consistent; and comparing its structure and outcomes with information not used in its construction. In addition to research on model validation, there is a growing recognition that our ability to evaluate models of dynamic spatial systems is being outstripped by our capacity for building them (Gardner and Urban, 2003; Manson, 2003). Many complexity-based models of land use, for example, remain unevaluated, and those that are evaluated tend to be so by extensions of standard statistical methods that are not oriented towards complexity as such (Verburg et al, 2005).

More importantly, though GISc is part of the broader effort of evaluating models of geographic complexity, it must also explicitly address the corollaries of complexity theory. GISc has very successfully concentrated on the mathematical and statistical evaluation of sensitivity and error propagation (Heuvelink, 1996; Lanter and Veregin, 1992); validation (Costanza, 1989; Pontius, 2000; Walker, 2003); and the conveying of uncertainty to decisionmaking (Ehlschlaeger et al, 1997; MacEachren and Kraak, 1997). However, geographic complexity faces broader methodological, conceptual, and policy challenges (figure 3).We highlight six distinct challenges in this paper: method- ological issues of sensitivity and scale; conceptual challenges of conflating pattern and process, and reconciling simplicity and complexity; and policy issues of the science ^ policy gap and postnormal science. There are many other challenges besides these, and within each we examine only a few critical aspects. Similarly, we examine key linkages between these challenges but acknowledge that there are others beyond the scope of this paper. Figure 3 traces relationships between challenges that can be understood as propagating through second-order and third-order relationships (for example, sensitivity is linked to scale and in turn to pattern versus process and to postnormal science).

## AT-need to speak lang of polmakers

**Policy-making is NOT closed system—Empirically, policy-makers have begun a shift towards complexity and resilience**

**Mangalagiu 2011**

[Diana Mangalagiu, Prof of Strategy at Smith School of Enterprise and Environment-University of Oxford “Risk and resilience in times of globalization” An emerging research program for Global Systems Science: Assessing the state of the art, 10/4/11, <http://www.gsdp.eu/>] Mangalagiu 3c

Despite the richness in conceptual thinking underpinning the concept of resilience, there is limited evidence of how groups, organizations are societies are translating the notion of resilience into practice. The constructivist tradition in social theory argues that social response is non- deterministic because of plural perception and the negotiations of values, cultures, choices and epistemologies. The managers are part of the system that is being managed and define the system and its characteristics in different ways. Understanding the loss, creation and maintenance of resilience through the process of co-discovery – scientists, policy makers, practitioners, stakeholders and citizens is at the heart of building the capacity to deal with whatever the future might bring.

Anecdotal evidence suggests that some societies are organizing for resilience. For example, both the governments of Canada and Singapore have resilience as the goal of their national strategic plans. There is a nascent literature emerging, as yet unmapped, on operationalizing resilience beyond the organizational level. For example, in an approach to adapting an urban delta to uncertain climate change, Wardekkar et al. (2009) identify five options for resilience: (1) homeostasis: incorporation of feedback loops; (2) omnivory: having several different ways of fulfilling needs; (3) flatness: preventing a system from becoming too top heavy enables more effective localized responses, self-reliance and self-organization; (4) buffering: the ability to absorb disturbances to a certain extent and (5) redundancy: having multiple options – routes, supply chains, etc – so that if one fails, others can be used. 11

## AT-Rational Mgmt Good

**Adaptation to complexity solves better than so called ‘rational management’**

**Voss and Bornemann 2011**

[Voß, J., and B. Bornemann. Technische Universität Berlin, Innovation in Governance Research Group, 2Leuphana Universität Lüneburg, Center for the Study of Democracy “The politics of reflexive governance: challenges for designing adaptive management and transition management” *Ecology and Society* 16(2): 9] Voss 3

DESIGNS FOR REFLEXIVE GOVERNANCE, AND HOW THEY CONSIDER POLITICS Adaptive Management Adaptive management is an approach to resource and ecosystem management that refers to functionally defined social–ecological systems with a regional scope, such as natural parks, river basins, mountain ranges, etc. (Walters 1986). With foundations in ecological systems theory and evolutionary theory (Holling 1978), AM has been postulated as a critical alternative to conventional rationalistic concepts of ecosystem management (Berkes et al. 2003a, Holling 2003). The literature pertaining to AM is quite diverse. Aside from theoretical contributions laying out the philosophical fundamentals of AM (Norton 1999, 2005), there is empirical research on the capabilities of governance arrangements to adaptively manage resilience (Berkes et al. 2003b; Lebel et al. 2006), as well as on the emergence of AM practices in various Ecology and Society 16(2): 9 http://www.ecologyandsociety.org/vol16/iss2/art9/ contexts (Olsson et al. 2004, 2006). Finally, a more prescriptive strand of literature that is at the focus of this article deploys guidelines and tools for setting up and implementing AM in practice (Sendzimir et al. 2006, Allan et al. 2009, see also www.adaptivem anagement.net/resources.php). Since it arose in the 1970s, the discourse has not yet yielded a singular notion of AM. Instead, we can observe a further conceptual differentiation as indicated by the emergence of approaches such as adaptive comanagement (ACM) and adaptive governance (AG) (Olsson et al. 2004, Brunner et al. 2005, Folke et al. 2005, 2009, Gunderson and Light 2006, Armitage et al. 2007a, 2009, Folke 2007, Kofinas 2009). Assumptions, conceptualization, and operationalization Adaptive management does not provide a blueprint for resource management, but rather some general ideas about social–ecological reality as well as conceptual suggestions of how to manage this reality. It rests on a set of distinct ontological assumptions condensed in “panarchy” (Gunderson and Holling 2002, Holling 2001), a general theory about the dynamics of complex social–ecological systems. According to panarchy, social–ecological systems exhibit unpredictable behavior and uncertainty that form the basic problem and “driving assumption underlying AM” (Sendzimir et al. 2006: 132). Given these fundamental problem features, classical approaches to resource management, which are based on models of linear dynamics or equilibrium and promote tight efforts to control, appear to be inadequate and ineffective (Berkes et al. 2003a). Following the proponents of AM, management rather has to establish and maintain the ability of social–ecological systems to adapt to complex and unpredictable change. Therefore, AM is conceptually concerned with learning, knowledge integration, and experimentation (Gunderson and Light 2006). First, AM is conceived of as an ongoing, structured, and reflexive learning process that allows for constant adaptation of the management practice to deal with the uncertainty of social–ecological development (Lee 1999, Sendzimir et al. 2006). Second, addressing the inherent complexity of these systems, AM puts particular emphasis on integrating various kinds of knowledge—scientific and professional as well as alternative forms of local and indigenous knowledge about social–ecological system behavior as well as management practices—to come up with a more comprehensive picture of the problems at hand (Berkes et al. 2003a). Third, the emphasis on learning and knowledge integration goes hand in hand with a focus on experimentation. Experiments are supposed to support knowledge acquisition and learning in order to explore the system’s true structure (Sendzimir et al. 2006: 140, see McLain and Lee 1996). Moreover, policies themselves are conceptualized as hypotheses to be tested and constantly refined in practice (Berkes et al. 2003a), rendering AM an ongoing experiment for developing steering activities in which the policy maker becomes a “nimble experimenter, with the patience to consider long-term consequences” (Sendzimir et al. 2006: 132). From a prescriptive perspective, these conceptual elements can be operationalized in terms of a structured learning cycle that links four phases integrating research, management, and practice (Sendzimir et al. 2006: 141, for an overview of descriptive process models; cf. Plummer 2009). The first phase is about improving the understanding of a given system by initiating discussion among the participants of an AM forum. The goal is to generate a balance of the known and the unknown that can serve as a basis for policy formulation in phase 2. As policies, from an AM perspective, are fundamentally directed at “learning to adapt,” they have to be designed in a flexible and reversible manner. Whereas the making of policies, accordingly, takes the form of designing and refining hypotheses, the implementation (phase 3) is conceived as a test of these hypotheses. Such a scientific approach is supposed to give policies a “disciplinary rigor of consistency in execution” (Sendzimir et al. 2006: 142) and prevent them from being changed during implementation. The fourth phase of the AM cycle entails the monitoring and evaluation of policy hypotheses in order to enable learning processes that improve the rationality of subsequent activities. In sum, AM is based on an idea of learning by doing (Berkes et al. 2003a: 9, Kato and Ahern 2008), “learning by experimenting” (Lee 1999) or “learning while managing” (Sendzimir et al. 2006: 140). It suggests a notion of management that integrates science and local knowledge with experimental practices (Olsson et al. 2004, Gunderson and Light 2006) in an ongoing, recursive learning cycle in order to adapt to the uncertainty and surprise of complex, large-scale systems (Sendzimir et al. 2006). Ecology and Society 16(2): 9 http://www.ecologyandsociety.org/vol16/iss2/art9/ Adaptive management and politics How does the conceptual literature on AM refer to politics and how can AM’s notion of politics be contoured against the framework sketched out above? A general observation is that the discussion about AM does not make extensive use of a language that reflects political phenomena. Politics is certainly mentioned in early contributions (Lee 1993, 1999) and even more so in recent strands of ACM and AG, which, emphasizing the social dimension, show an expanded “political vocabulary” that refers to the political context and political success conditions of AM (Plummer 2009). However, the reflection of politics does not seem to be at the conceptual core of AM. Nonetheless, politics does serve as an important reference point for AM. Initially, AM was articulated from a distinctly critical perspective on existing regimes of resource politics: as an approach directed at improving resource policy making by overcoming its modernist fallacies and political disruptions (see above). This shines through in various theoretical, normative, methodological, and practical features of AM. On a theoretical level, AM conceives of the link between management and ecological resource systems in terms of a coevolutionary relationship facilitated by feedback loops (Berkes et al. 2003a). Concepts such as “feedback,” “coevolution,” “selforganization,” and “resilience” suggest an ontology of integrated social–ecological systems that evolve quasi-automatically according to inner mechanisms of mutual structuring, but detached from political dynamics. Newer approaches of ACM and AG do in fact expand the scope of reflection on the management side of these systems to include a larger multi-layered governance structure (Folke et al. 2005, Folke 2007). However, they still build on AM’s notion of systemic relationships to be managed, but not to be shaped politically. This implies a particular normative claim regarding the purpose of governance: rather than politics—in the sense of, for example, political actors with values, interests, and ideas—it is the functional imperative to maintain the resilience of social– ecological systems investigated by AM experts that is supposed to govern the world (Leach et al. 2007: 26–27). A claim that is, in fact, highly political because not only does it favor a particular goal of governance whose definition involves political value questions (Nadasdy 2007) but also a particular mode of managerial decision making, yet it disregards others (e.g., majority rules). Methodologically, AM adopts a science-like approach to problem solving that involves the design, testing, and reformulation of hypotheses as elements of a more comprehensive cycle of learning that includes practical experimentation, the integration of different kinds of knowledge, as well as a variety of modeling techniques. Newer approaches embed this rather cognitive methodology in social practices characterized by concepts such as trust, vision, learning, collaboration, selforganization, creativity, innovation, power sharing, partnerships, etc. (Folke et al. 2005, Berkes 2007). Altogether, these design features render AM an effort at exploring the truth of resilience by the systematic acquisition and integration of knowledge through collaborative experimentation and learning. Practical AM approaches, such as the one suggested by Sendzimir et al. (2006), aim at overcoming the “fundamental weaknesses of modern policy processes” (Sendzimir et al. 2006: 143) by excluding the political from working AM arrangements. Political items such as interests, opinions, and mandates are expected to be left outside of the AM forum due to their potential to provoke conflict, disturb cooperation, and thus foster irrationality. It is assumed that this can be achieved by selecting participants according to particular criteria such as competence, respect, and willingness to cooperate and by obliging them to “leave [their] gun[s] at the door” (Sendzimir et al. 2006: 142).

## AT-Cmplxty too complex

**Turn: Complexity’s recognition of uncertainty is the first step to integrated knowledge**

**Suteanu 2005**

[Cristian, Professor of geography and environmental science at Saint Mary’s University “Complexity, Science and the Public” *Theory, Culture & Society* Vol. 22(5): 113–140]

Concluding the Tale of the Changed Pillars  What complexity has accomplished regarding the classic requirements of  the scientiﬁc approach goes beyond the limits of a theory and transcends  the boundaries of disciplines. We are not dealing here only with deeper  knowledge in previously established directions. What we actually have is a  new interpretation. What we see is a new geography, involving new means  of orientation.  Measurability can now be addressed, even when the entities under  study are very complex and variable, as is the case with traces of social or  economic dynamics. Measurements, however, are no longer measurements,  at least in the classic sense. The numbers we acquire demand a different  interpretation: they point, for instance, to the degree of irregularity of the  studied object.  Reproducibility – in its classic form – ceases to be a necessary  condition of the scientiﬁc approach. When dealing with processes which are  not reproducible, if we want to approach them fruitfully we do not look at  the details of their trajectories but rather consider patterns instead. This  opens unexpected new gates to studies of complex situations, such as those  found in the social realm. In fact, the new taxonomic schemes rely on  categories of patterns. Interestingly, we can use the above-mentioned  measurement techniques to characterize the patterns in a rigorous fashion.  Predictability has also acquired a different meaning. Its accuracy can  be evaluated, and we may ﬁnd intrinsic limits to prediction set by the very  nature of the system under study. However, an appropriate description of  1patterns means also the possibility of making long-term predictions, if not  about the details themselves, at least about the probable pattern of system  behaviour (Turcotte, 1993).  Measurability, reproducibility and predictability are thus subject to  new interpretation, which, in turn, changes the landscape substantially. An  essential feature of the new landscape is created by a different interpretation of those events perceived as catastrophes. Large-size events –  economic crises, for instance – may be the result of cumulative interactions  among participating actors and not necessarily the outcome of exceptional  factors or external inﬂuences. If the pattern of system dynamics includes  events of all sizes, with many small events, fewer medium-sized ones and  very few large ones (Bak, 1996), we have to admit that large-size events are  embedded in the functioning of the system. Such catastrophes are thus part  of the system scenario and, from that point of view, they are as ‘natural’ as  the smaller events.  These ﬁndings imply a world that is inherently open, capable of new  forms and even more challenging than we had expected. ‘In accepting that  the future is not determined’, says Prigogine (1997: 183), ‘we come to the  end of certainty. Is this an admission of defeat of the human mind? On the  contrary, we believe that the opposite is true. . . . Our belief is that our own  age can be seen as one of a quest for a new type of unity in our vision of  the world’ (1997: 186).  This is indeed true from the viewpoint of scholars, or at least of some  of them. Could this be also the case for the public at large?

## AT-Realism -1

**Realists like Waltz or Mearsheimer fail in predictions – complexity proves**

**Kissane, 2008** – assistant dean at the Centre d'Etudes Franco-Americain de Management, lecturer at the University of South Australia, PhD from the University of South Australia in International Relations theory (Dylan, “Thinking about Power in a Complex System”, found online)//BZ

Realists, then, find some common ground whether describing ancient Grecian warfare or twenty-first century nuclear strategies. Key to all is the military element of an international actor’s power. All realists place great emphasis on the military capabilities of actors (whether city-states, Princes, states or superpowers), some even placing all their emphasis on this sole element of power. Some realists, though, expand the notion of what constitutes power in international relations by recognizing a multifaceted notion of power. Economic potential, the power of propaganda over national and international opinion and the capacity to lead are all mentioned as elements of power alongside basic military potential. Realists, too, focus on the power of the most significant actors in the system. For Thucydides and Machiavelli, for example, these are relatively smaller actor such as city-states and Princes that may exist alongside dozens of others in a small geographical region. Alternatively, for Carr, Morgenthau and Waltz the focus is on nation-states, with Mearsheimer narrowing his focus even further to what he refers to as ‘great powers’. While not in all cases explicitly denying that power can be held by an actor other than these, they are secondary to how realists imagine their world of conflicting powers. Central to all the realist approaches, however, is the commitment to the notion of an anarchical international system. Every realist imagines an international political environment where there is no overarching authority, where other actors can never be trusted and where power, as a result, is hoarded by the largest international actors. Realists like Hobbes even argue that the lack of overarching authority is the reason that large international actors emerge and seek power at all. Under anarchy realists opine that power exists only at the highest levels and maintain a focus on those levels to the exclusion of all other levels of political interaction. In short, if it is not happening between states – or in state-backed bodies such as international institutions, for example – then it falls outside of the realm of international politics and discussions of international power are out of place, too. Yet if the international system is assumed to be something other than anarchic, if the base nature and constraints on interactions between international actors is held to be something other than anarchic, it is likely that our understanding of what constitutes power must also change. While realism offers a developed prism by which to comprehend international politics in an anarchic system, a new conception of the international system demands that we seek a new prism by which to imagine, describe, explain and predict it. In the section that follows the basic elements of this alternative understanding of international politics will be outlined, explained and explored and the reasons why such a system demands a new conception of power in international politics posited.

## AT-Realism -2

**Realism is too focused on large actors- fosters bad research methods**

**Sil and Katzenstein, 2010** – Sil is an Associate Professor of Political Science at the University of Pennysylvania while Katzenstein is a Professor of International Studies at Cornell (Rudra and Peter, “Analytic Eclecticism in the Study of World Politics: Reconfiguring Problems and Mechanisms across Research Traditions”, part of UPenn articles collection, <http://www.polisci.upenn.edu/faculty/RSEclectic2010.pdf)//BZ>

For example, in international relations, realism initially provided a common conceptual apparatus for framing and investigating problems related to the outbreak of war, the formation of alliances, and the distribution of capabilities among states. Similarly, modernization theory in comparative politics provided a common framework for formulating questions and generating comparable data on the relationships between economic, social, and political change across vast expanses of time and space. In both instances, shared boundary conditions and theoretical vocabularies employed by adherents of a research tradition facilitated the production and assessment of new knowledge claims concerning new phenomena. Later, these arguments invited challenges and became foils for newer research traditions, as in the case of neoliberalism and constructivism in inter-national relations or of rational-choice theory and historical institutionalism in comparative politics. Each of these newer traditions distinguished itselfby distinct sets offoun- dational assumptions that facilitated the creation of new problematiques and new analytic frameworks that helped to expand the range of substantive arguments and the stocks of empirical knowledge in its respective field. To the extent that this stylized process is a reasonable representation of the changes that have occurred in the two subfields, it reveals why the emergence of, and competition between, research traditions can expand the fund of ideas, concepts, observations, and theories for a field. These intellectual benefits are valuable and should not be forfeited. However, they come at a high price in the absence of a counterweight in the form of eclectic modes of inquiry. Research traditions establish their identities and boundaries by insisting on a strong consensus on enduring and irreconcilable foundational issues. This, in turn, effectively privileges some concepts over others, rewards certain methodological norms and practices but not others, and places great weight on certain aspects of social reality while ignoring others. In fact, the battles among research traditions recur not because of hardened differences over substantive issues but over preexisting epi- stemic convictions about what kinds ofsocial phenomena are amenable to social analysis, what kinds of questions are important to ask, and what kinds of processes and mechanisms are most likely to be relevant. Research tra-ditions give themselves permission to bypass aspects of a complex reality that do not neatly fit within the metatheo- retical parameters they have established by fiat. These aspects are either “blackboxed,” relegated to “context,” or treated as “exogenous.” Such simplifying moves, while helpful for the purpose of generating elegant knowledge claims about particular aspects of reality, are not independently capable of generating a more comprehensive understanding of complex, multi-faceted problems that interest scholars and policymakers alike. For this purpose, scholarly analysis needs to be more open-ended, proceeding from ontologies that, as Peter Hall notes, embrace “more extensive endogeneity and the ubiquity of complex interaction effects.”14 This is where analytic eclecticism has a distinctive role to play alongside, and in engagement with, different strands ofscholarship embedded in multiple research traditions.

## AT-Aff objections to ‘critical theory’

**We’re NOT critical theory, but instead a complex sociology of risk**

**Mangalagiu 2011**

[Diana Mangalagiu, Prof of Strategy at Smith School of Enterprise and Environment-University of Oxford “Risk and resilience in times of globalization” An emerging research program for Global Systems Science: Assessing the state of the art, 10/4/11, <http://www.gsdp.eu/>] Mangalagiu 1b

While economic and technical risk assessments are similar with regard to their reductionist and one-dimensional view of the world, narrowing down risk analysis to a form of quantifiable expected value, psychometric, sociological, and cultural views take a multi-dimensional view that is concerned with 5 the myriad forms of risk perception. In Renn’s (1992) systemic classification of risk perspectives the main applications of the latter group are therefore seen in policy making, regulations, mediation, and risk communication, whereas the former be applicable for decision making (insurance, health, environmental protection, and safety engineering).

The different research strands can further be summarized regarding their theoretical focus on either the actual assessment of risk, the perception of risk, or blended approaches. Technical, economic, and quantitative social benefit approaches to measure risk can be counted towards those perspectives concerned with practical risk assessment (see e.g. Just, Heuth, & Schmitz, 1982; Lowrance, 1976; Starr, 1969), also apparent in the broad use of the value at risk concept in finance, which basically attempts to calculate an expected value of losses (see e.g. Jorion, 2007).

The psychological perspectives look into the perception of risk at an individual level (see e.g. Boholm, 1998; Slovic, 1987; Tversky & Kahneman, 1974) while the cultural theories of risk are concerned with the perception of risk at a collective level, as they see risk as the result of what different groups within a society – shaped by their social norms, values, and ontological assumptions – perceive as potential hazards (see Douglas & Wildavsky, 1982; Rayner, 1992; Thompson et al, 1990). In a way, cultural theories of risk attempt a form of risk assessment in a qualitative and social constructivist manner, while psychological theory examines the different perceptions of objective risks. Cultural theory has been criticized for seeing individuals only in aggregate, as being too simplistic, rather descriptive, and as being difficult to measure empirically (Renn, 1992). Marris et al. (1998) find some support for both the psychological and the cultural theory paradigms, although the cultural theory explains only very little variance in risk perception. As the only common denominator of sociological theories of risk is their awareness that human actors can only perceive the world through subjective social and cultural influences (Renn, 1992), they may best be seen as blended approaches leaning towards either weak or strong constructivist positions. Sociological perspectives further take into account what consequences arise from risk for the society (see e.g. Beck, 1992; Giddens, 1999) and bring fairness and competences into the picture, which can provide a basis for normative conclusions regarding risk policies (Renn, 1992).

The different theoretical conceptions of risk are non‐exclusive and can nurture each other. One attempt to integrate different perspectives consists in the Amplification of Risk framework, which builds on the analogy of signaling theory and sees risks to emerge from signals of initial real risks amplified in several steps of social interaction processes influenced by cultural setting (see Kasperson, et al., 1988; Kasperson, 1992; Kasperson, et al, 2003; Renn, et al, 1992).

## AT-Positivism-1

**Positivism fails because complex risks involve issues of politics and power**

**Mangalagiu 2011**

[Diana Mangalagiu, Prof of Strategy at Smith School of Enterprise and Environment-University of Oxford “Risk and resilience in times of globalization” An emerging research program for Global Systems Science: Assessing the state of the art, 10/4/11, <http://www.gsdp.eu/>] Mangalagiu 1c-e

2.b Systemic risk in the futures literature

In the futures literature2, the term ‘systemic risk’ is not featured frequently and has only been used recently (Checkley 2009). Other terms akin to systemic risk are in more frequent use. They comprise complex hazards (de Souza Porto & De Freitas 2003), extreme risks (Nakau 2004), emerging risks from science and technology (Wiedemann et al. 2005), catastrophic risk (Geiger 2005), natural disaster-triggered technological (natech) disasters (Cruz et al. 2006), extreme risks and human extinction (Tonn & MacGregor 2009), and high impact low probability events (Ord et al. 2010). While the last view of systemic risk (high impact with low probability event) comes closest to a definition, no coherent understanding of systemic risk yet exists.

Arguments for post-normal approaches to science and decision-making have been made in the literature, especially so for systemic risk (or close terms), but the explicit treatment of systemic risk so far is limited to case studies and selective areas of threats in the future. It seems that catastrophic or systemic risks per se have been of greater interest in the futures literature so far than the methods and tools to deal with them.

One stream of literature focuses on a conceptual approach to systemic risk. In this stream, three groups can be distinguished. The first follows a positivistic endeavor akin to classic risk management approaches quantifying systemic risk to make it measurable and in consequence manageable. The second group applies narrative scenario techniques and describes possible future systemic risks. The third class of works considers a classification of the severity of threats to mankind, and aims to identify the most threatening ones.

In an attempt to answer the question how much costs are bearable to protect against a catastrophic event, Nakau (2004) proposed a risk evaluation model, which classifies extreme events quantitatively. Based on stochastic probability he introduces tolerable levels of failure probabilities as a sustainability criterion, i.e. how many victims constitute a certain level of impact. Checkley (2009) employed an empirical test that explains the creation of systemic risk in a venture capitalist context, seeing systemic risk as risks affecting all parties. They argue that such risk occurs as mutual funds diversify their investment among several venture capitalists, but those syndicate for investment projects – so, diversification effects are unmade and are thus pseudo, which in turn gives rise to systemic risk.

A series of scenario works in 2009 have considered narratives explaining possible paths to the extinction of the human race (see Coates 2009; Goux-Baudiment 2009; Tonn & MacGregor 2009). Tonn & MacGregor (2009) describe a chain of events that can lead to the extinction of the human race over the next 1000 years. Goux-Baudiment (2009) on the other hand imagines a chain of events that could lead to human extinction in only 150 years. He further investigates the human agency in this scenario, and whether and how human interaction could break this disastrous chain of events. Tonn (2009) adds to those perspectives as he derives a theoretically acceptable risk level of human extinction from qualitative criteria (i.e. fairness, unfinished business, and maintaining options). He finds that the objectively acceptable level is lower than the currently (subjectively) expected level and concludes that risk must therefore be reduced.

In a different approach, Coates (2009) discussed extreme risks that humankind faces. He developed a classification system for those events, which centers on the severity of extreme events. The approach is similar to Nakau (2004) as it attempts to evaluate severity of risks, but different as it does not rely on quantitative criteria. Coates concludes that a nuclear winter, the use of nuclear weapons, and the eruption of a super-volcano are the most severe threats to civilization and humankind, but that other events such as asteroids also bear some risk.

Another stream of literature focuses on the perception and social construction of systemic risk. First, studies look into the paradoxical situation of policy makers to stimulate innovation but also to regulate risks arising from accelerating innovation. This argument is put forward to support post-normal science and decision-making as the appropriate approach to modern (systemic) risk management situations. Then, risk perception biases for catastrophic risk have been examined and ultimately, the classic reductionist treatment of risk management was held responsible for rising occupation with risk in society.

Public actors play a paradoxical role in the relationship between risk and innovation, between the interests of the public and private actors (Ravetz, 2003). Ravetz sees accelerating innovation as a necessary tool for private companies to compete in a ‘globalizing knowledge economy’ and the role of the public to ensure an environment in which speedy innovation can take place. On the other hand, public actors need to ensure the safety of new technologies and innovation acting as an agent for their citizens, remaining the source of public trust and safety provider for citizens. Besides this paradoxical role, technological innovation threatens the global environmental system; so, how much technological 7

innovation is desirable and how much risk in it acceptable? Ravetz argues that finding appropriate answers to this question can only be found in a policy-making process that involves the public in dialogues about scientific findings and by disclosing ambiguities in scientific finding, thus embracing policy principles for a post-normal world of science.

In a similar vein, Glenn & Gordon (2004) consider four scenarios on the ‘balance between risk and promise’ public actors have to manage as part of the Millennium Project. Building on those scenarios they identify four policies that are beneficial in all of those (considering some threats explicitly, establishing a mechanism for the disclosure of threats from scientific discovery, develop mitigation strategies along with technological development and their risks, and the teaching of science ethics). De Souza Porto & De Freitas (2003) also provide a perspective on the relationship between risk and technology, and the difficulties it creates for policy makers. They use the concept of ‘vulnerability’ to describe how simple hazards can become complex, when they are considered in the context of their social environment; in industrialized countries it is common that hazards are coupled with ‘social and institutional vulnerabilities’. They use chemical accidents to illustrate how this vulnerability evolves. Economically, a residual level of risk may be acceptable, but from a moral perspective this might not be the case. To account for this, they argue for an empowerment of vulnerable groups and contextualizing risk assessment in a post-normal fashion.

Ravetz (2004) provides another argument for ‘post-normality’ as the adequate approach for science and policy-making when decision stakes are high or risks very uncertain. As those features are unavoidable in many modern risk management situations, post-normal decision-making processes are an unavoidable consequence. Gregory et al. (2006) further question the role scientific information can play in decision-making. Taking the example of environmental risk management, they show six pitfalls where the role of scientific information is falsely overemphasized in environmental risk management decisions. Accordingly, they also demand post-normal decision-making approaches in which value judgment implicit in scientific processes are made explicit.

## AT-Positivism-2

**Appeals to quote-unquote ‘objective knowledge’ makes no sense in the transportation planning context**

Richard **Willson ’01** (*Department of Urban and Regional Planning, California State Polytechnic University*) p. 6 *“*Assessing communicative rationality as a transportation planning paradigm”

The claims for objectivity in data and models that underpin instrumental rationality have been challenged from numerous standpoints. Quantification draws attention to some things and hides other things, such as equity issues or qualitative considerations. For example, studies of travel patterns by gender reveal differences formerly hidden in aggregate data. Wachs (1985) points out that models are also manipulated to produce predetermined outcomes. More broadly, Throgmorton (1993) argues that analytic techniques do not present an objective truth, but instead act as figures of speech and argument. In other words, a survey instrument or model does not exist disconnected from speechin a place and time. Surveys and models have an audience, they respond to what came before, they construct the roles of planners and others and they are built on language concepts. Finally, Harvey (1985) suggests that transportation models must respond to the fact that “values are invoked and mediated through the process, rather than resolved at an early stage” (pp. 458). When models ignore this reality, as they often do, their results become less relevant to decision making. Yet model results and analytic data are often presented as “findings” rather than a form of discourse.3 Many observers of transportation planning recognize that political and institutional aspects in transportation are ignored by the conventional approach (Wachs 1985). Reviewing planning theories that bear on transportation planning, Meyer and Miller (1984) advocate decision-centered transportation planning and identify a broad range of influences on the planning process, including rational comprehensive planning, incrementalist planning, advocacy planning, policy planning, and strategic planning. They argue for an approach that will help decision-makers reach good decisions rather than focus exclusively on the “right” answer.

**Complexity makes data fundamentally ambiguous—Quesitons of interpretation come first**

Klijn 2007, (**Erik-Hans Klijn,** *Department of Public Administration at Erasmus University Rotterdam, the Netherlands,* Managing Complexity: Achieving the Impossible? Management between complexity and stability: a network perspective, **Critical Policy Analysis** (2007), vol. 1, no. 3, pp. 252-277.)

**Complexity arises when one begins to discuss the content of decisions. Identifying complexity from a network perspective should include an analysis of the various perceptions of the actors** (Koppenjan/Klijn, 2004). **This illustrates that content is fundamentally ambiguous in the sense that actors perceive the problems that are being discussed differently, have different opinions about the desirable solutions and make different interpretations of available information or research that is being done** (Lindblom/Cohen, 1979; Rein/Schon, 1994).

## AT-Positivism-3

**Objective data not enough—Infrastructure planning requires consideration of values**

**Innes 2000**

Judith E. Innes (Ph.D. from MIT’s Department of Urban Studies and Planning and an undergraduate degree in English from Harvard University. And Professor Emerita of City & Regional Planning greenopolis.com/files/.../**Indicators**\_for\_sustainable\_development.pdf)

A system performance indicator is one that reflects how the system is working. It should¶ be understandably related to a shared and basic community value. A system indicator¶ can be an aggregate or simply a measure of something that varies with the outcome of¶ interest. For example instead of measuring quality of life as a composite of housing,¶ weather, economy and the like, one can measure satisfaction from a survey of people’s¶ perceptions and attitudes. Or alternatively a measure like in-migration levels or the¶ numbers of people that are moving out of a city might be an indicator of quality of life.¶ Total waste generated could be a simple indicator of resource consumption, while also¶ reflecting public attitudes and responses to the challenge of sustainability. The number¶ of such measures is necessarily limited because of the public time and energy needed to¶ develop them and because public attention to the results is not infinite.

# MPX—Ecol Resilience

**Survival requires shifting stability to adaptive resilience—We must reckon with the LIMITS of social-ecological systems**

**Wilkinson 2012**

[Cathy Wilkinson, urban spatial planning at Stockholm Resilience Centre, Stockholm University, “Social-ecological resilience: Insights and issues for planning theory” Planning Theory May 2012 vol. 11 no. 2 148-169] Wilkinson 6

*Issues for planning theory*

Social-ecological resilience scholarship significantly under-theorizes power, politics and conflict (Evans, 2011; Hornborg, 2009), a point increasingly acknowledged within the field (Folke et al., 2010) and beginning to be addressed in relation to urban systems (e.g. Pelling and Manuel-Navarrete, 2011). For planning theory this matters in many ways. How human–nature relations are conceptualized significantly informs the basis for governance of social-ecological systems. It informs what and whose knowl­edge matters and to what end this knowledge is put. Significantly, it also critically informs how the analysis of social-ecological systems is approached through research.

However, what social-ecological resilience scholarship does increasingly well is to expose aspects of the materiality of the ecological condition from a perspective that recognizes that social-ecological systems are linked, thus highlighting both society’s critical impact and dependence on ecosystems. It does this at both the local scale (e.g. the role of social-ecological memory in maintaining biodiversity in urban gardens in Stockholm) (Barthel et al., 2010) and the global scale. At the global scale, through the identification of nine planetary boundaries, it reminds us of the planetary biophysical limits necessary for human survival, and expands our gaze to include not only climate change but other ecologically significant wicked problems, including biodiversity loss and ocean acidification (Rockström et al., 2009). Importantly, it emphasizes the con­nectivity of these problems across scales (Walker et al., 2009). I argue that this type of social-ecological resilience research is of significant interest at a time when planning theorists are calling for more attention to substantive matters alongside matters of pro­cess. While ecological considerations are undoubtedly of increasing importance for planning practice (Davoudi et al., 2010; Murdoch, 2006), planning theory appears to have paid minimal attention to them. Social-ecological resilience turns our attention in planning theory to critical substantive matters of the impact of planning approaches, methods and decisions on ecosystem services.

## MPX—Ecol Resilience

**Resilience outweighs stability—Premising policy on predicting complex social-ecological systems with nonlinear tipping points ensures global disaster**

**Wilkinson 2012**

[Cathy Wilkinson, urban spatial planning at Stockholm Resilience Centre, Stockholm University, “Social-ecological resilience: Insights and issues for planning theory” Planning Theory May 2012 vol. 11 no. 2 148-169] Wilkinson 4

**Social-ecological resilience: An overview**

Social-ecological resilience originates in ecology, when Holling (1973) challenged the fundamental assumptions of stability (and therefore predictability) as the primary char­acteristics of ecosystems and their management. Until then, a quantitative measurement of ‘stability’ (e.g. fixed quota for harvesting, maximum sustainable yield) had driven most ecosystem modelling and management efforts based on a world view that empha­sized ‘equilibrium, the maintenance of a predictable world, and the harvesting of nature’s excess production with as little fluctuation as possible’ (Holling, 1973: 21). Accordingly, Holling (1978) argued that a management approach based on resilience would by con­trast ‘emphasize the need to keep options open, the need to view events in a regional rather than a local context, and the need to emphasize heterogeneity’.

The concept of the *adaptive cycle* is central to social-ecological resilience. Holling introduced the adaptive cycle to describe the general characteristics of dynamic change in ecosystems as comprising four phases – exploitation, conservation, release and reor­ganization (Gunderson and Holling, 2002; Holling, 1986; Holling and Sanderson, 1996). The adaptive cycle challenges the traditional view of ecosystem succession as a linear process shifting from *‘exploitation*, in which rapid colonization of recently disturbed areas is emphasized (to) *conservation*, in which slow accumulation and storage of energy and material are emphasized’ (Gunderson and Holling, 2002: 33). Berkes et al. (2003: 16) use the example of a forest which ‘goes through the stages of growth and maturity, followed by a disturbance, such as a fire, which releases the nutrients on the way to a new cycle of growth’, the point being that ‘forest succession should be seen, not as a unidi­rectional process … but as one phase of a cycle in which a forest grows, dies, and is renewed’ (Berkes et al., 2003: 17). By focusing only on the exploitation and conservation phases, natural resource management prioritized controlling disturbances (e.g. prevent­ing/extinguishing forest fires) to increase short-term economic production, unaware of the impact these management choices have on the overall resilience of the relevant social-ecological systems. In the case of some forests, resilience is affected as some tree species require fire to release seeds for germination, and the longer a region goes without fire, the more intense and catastrophic the eventual fire event will be. Attention to the release and reorganization phases that follow periods of disturbance or crisis fundamen­tally challenged previous assumptions of equilibrium, stability and predictability in natu­ral resource management. Gunderson and Holling (2002: 74) subsequently introduced the concept of ‘*panarchies*’ to ‘capture the adaptive and evolutionary nature of adaptive cycles that are nested one within the other across space and time scales’, thus emphasiz­ing the importance of cross-scale dynamics.

*Adaptability* to change is a key focus for governing for social-ecological resilience in complex adaptive systems facing irreducible uncertainty. Social-ecological resilience offers the ideal process of adaptive co-management. Adaptive co-management refers to recent efforts to bring together two emerging approaches to natural resource manage­ment that attempt to deal better with uncertainties and complexities – ‘co-management’ (Holling, 1986), with its attention to matters of user participation in decision-making, and ‘adaptive management’, with its focus on ‘learning by doing in a scientific way to deal with uncertainty’ (Armitage et al., 2007: 1).

Interest in the concept of social-ecological resilience grew rapidly following Holling’s 1973 seminal publication (see Folke, 2006 for a summary) and there have been at several shifts in focus. The first important shift was towards an integrated approach to social-ecological systems. Human and natural systems are conceptualized as truly interlinked and interdependent systems and are thus defined as one system, a social-ecological sys­tem, with the separation between human and natural systems being a human construct that had immense impact in shaping our world views (Berkes et al., 2003). ‘Social’ here is used as a general term that includes social, cultural and economic systems (Berkes et al., 2003). The significance of this shift is that it has broadens the scope from ‘adaptive management of ecosystem feedbacks to understanding and accounting for the social dimension that creates barriers or bridges for ecosystem stewardship of dynamic land­scapes and seascapes in times of change (Gunderson et al., 1995)’ (Folke et al., 2010: 4).

Whilst early resilience research drew on primarily empirically based local studies, there is now emerging scholarship focused at the *global scale* including recent publica­tions on ‘planetary boundaries’ (Rockström et al., 2009), earth system governance (Duit et al., 2010), regime shifts (Biggs et al., 2009) and others. Research led by resil­ience scholars, recently identified nine planetary bio-physical boundaries (Rockström et al., 2009). The authors argue that these define a ‘safe operating space’ for humanity and that three of these – climate change, biodiversity and nitrogen load – have already been exceeded. In the article the scientists emphasize that, whilst climate change is currently receiving significant international attention, perhaps the greatest challenge is the interconnectivity of each of the nine and the non-linearity of causal relationships between them.

Identifying and generating better understanding of so-called ‘*regime shifts*’ is a signifi­cant focus of research concerned with identifying means for detecting and avoiding eco­logical regime shifts (Biggs et al., 2009; Brock and Carpenter, 2010; Scheffer et al., 2001). A regime shift is ‘a change in a system state from one regime or stability domain to another’ (Folke et al., 2010: 3). Undesirable ecological regime shifts include desertifica­tion, eutrophication of lakes, coral die-off (Scheffer et al., 2001) and of course global warming. Ecological regime shifts matter to social-ecological resilience because of the adverse and often unequal impact they have on communities. Early detection of regime shifts requires knowledge of thresholds. A *threshold* is ‘a level or amount of a controlling, often slowly changing variable in which a change occurs in a critical feedback causing the system to self-organize along a different trajectory, that is, towards a different attractor’ (Folke et al., 2010). Whilst ecologists focus on ‘means for detecting and avoiding ecologi­cal regime shifts’, they also call for ‘research on policy processes that are better suited to managing complex systems subject to regime shifts’ and argue that ‘such processes would reduce inertia and enable society to respond more rapidly to information about impending regime shifts, better account for the existence of policy windows when planning manage­ment interventions, and rely on leading indicators, rather than adverse environmental impacts, as triggers for management action’ (Biggs et al., 2009: 830).

Understanding processes of social-ecological transformation and transition is an emerging focus: ‘resilience is not only about being persistent or robust to disturbance. It is also about the opportunities that disturbance opens up in terms of recombination of evolved structures and processes, renewal of the system and emergence of new tra­jectories’ (Folke, 2006: 259). In this respect there is increasing dialogue between social-ecological resilience scholars (e.g. Olsson et al., 2006) and socio-technical tran­sitions scholars (e.g. Smith and Stirling, 2010). Whilst it is recognized these two fields ‘conceptualise their objects of study in similar ways (van der Brugge and Van Raak, 2007; Foxon et al., 2009)’, it is recognized that both areas need to deal more funda­mentally with the political dimensions of sustainability including questions over ‘who governs, whose systems framings count, and whose sustainability gets prioritized’ (Smith and Stirling, 2010: 1).

Social-ecological resilience is concurrently a scientific discipline, a governance approach and an increasingly important urban policy discourse. The following sections critically explore the implications of the central underlying assumptions of social-ecological resilience, namely how dynamics of change, human–nature relations and gov­ernance are conceptualized. The focus here is on what, if any, new conceptual ground social-ecological resilience offers planning theory and what broader issues are raised for planning theory.

## MPX-Ecol Resilience

**Sustainable policy requires the politicization of knowledge and embrace of the inherent uncertainty in complex social-ecological systems.**

**Voss and Bornemann 2011**

[Voß, J., and B. Bornemann. Technische Universität Berlin, Innovation in Governance Research Group, 2Leuphana Universität Lüneburg, Center for the Study of Democracy “The politics of reflexive governance: challenges for designing adaptive management and transition management” *Ecology and Society* 16(2): 9] Voss 1

ABSTRACT. New concepts of governance take account of ambivalence, uncertainty, and distributed power in societal change. They aim for reflexivity regarding the limits of prognostic knowledge and actual control of complex processes of change. Adaptive management and transition management are two examples that evolved from the analysis of social–ecological and sociotechnical systems, respectively. Both feature strategies of collective experimentation and learning. In this paper, we ask how these two designs of reflexive governance consider politics. Based on a framework of different dimensions and levels of politics, we show that they are mainly concerned with problem solving by a focal process, but conflict and asymmetric power relations, as well as the embedding of processes within broader political contexts, are neglected. We suggest two routes for integrating politics into the design of reflexive governance: (1) recognize the politics of learning for sustainable development and develop safeguards against domination and capture by powerful actors, and (2) systematically consider the embedding of governance designs in political contexts and their ongoing dynamics for political fit. Key Words: adaptive management; embedding in political context; governance design; politics; reflexive governance; societal learning; transition management INTRODUCTION The boundaries of what is considered the challenge of environmental governance have been increasingly expanding. Early approaches to environmental governance focused on land development and pollution and aimed at protecting nature and human beings from disturbing interventions. Later, societal production and consumption as well as technology were recognized as part of the problem; environmental governance was, thus, directed at shaping society and technology in order to maintain social–ecological systems. Most recently, the patterns and processes of governance itself have come to be identified as challenges in working toward sustainable development because they define the very capacities by which societies shape and transform themselves. This recent turn does not merely indicate a further broadening of focus, but a shift in perspective. The recognition of governance as part of the problem structure eliminates the position of an external supervisor and navigator of social change. There is no longer an outside from where neutral diagnosis and sovereign intervention can proceed. Governing sustainable development thus becomes concerned with its own conditions, the making of its own knowledge, the developmental dynamics of its own practices, and its (often) unintended consequences (Rip 2006, Voß and Kemp 2006, Smith and Stirling 2007). This reflexive stance toward governance abandons the assumption of “one” adequate problem framing, “one” true prognosis of consequences, and “one” best way to go that could be identified in an objective manner from a neutral, supervisory outlook on the (social–ecological) system as a whole. Instead, it integrates a diversity of perspectives, expectations, and strategies in a complex understanding of societal change. It embraces the understanding that societal change results from a multiplicity of distributed efforts at shaping it; and it searches for ways to retain the multi-dimensionality of problems, the openness of futures, and the diversity of approaches in searching for ways to cope with challenges of sustainable development. From different research traditions such as ecology (Holling 1978, Armitage et al. 2007a), technology and innovation studies (Kemp 1994, Elzen et al. 2004), and policy studies (Kenny and Meadowcroft 1999, Lafferty 2004, Voß et al. 2007), efforts have been made to work out the implications of this shift in perspective for the design of governance arrangements. These discussions have yielded a variety of new governance designs that feature some common threads: although acknowledging a fundamental ambivalence of goals, uncertainty of knowledge, and distribution of power, they all emphasize participation, experimentation, and collective learning as key elements of governance. As such, they have been grouped together under the heading of reflexive governance (Voß et al. 2006). Two specific designs of reflexive governance that are the focus of this paper are adaptive management (AM) and transition management (TM). Both terms, although using “management” to invoke earlier traditions of resource management and innovation management, represent specific policy-oriented discourses that focus on the conceptualization of particular processes of social regulation. As such, we describe them as designs for governance. From within both discourses, explicit references to the concept of reflexive governance have been made (Szendzimir et al. 2006, Kemp and Loorbach 2006). Recently, concerns have arisen about the political implications of reflexive governance in general, and TM and AM in particular (Shove and Walker 2007, Armitage 2008, Kern and Smith 2008, Voß et al. 2009a, Smith and Stirling 2010). As empirical research into the practice of participation, experimentation, and collective learning has shown, reflexive governance designs interact with realworld political contexts that influence their functioning and impair their effectiveness (Lee 1993, McLain and Lee 1996, Walters 1997, Conley and Moote 2003, Hahn et al. 2006, Armitage et al. 2007b, Kemp et al. 2007b, Plummer and FitzGibbon 2007, Walters 2007, Allan and Stankey 2009, Kallis et al. 2009). Furthermore, there are concerns about the democratic legitimacy of reflexive governance designs pertaining to issues such as unclear links with institutions of representative democracy (Hendriks and Grin 2007, Hendriks 2009b, Kallis et al. 2009: 640), their potential to marginalize particular interests and social groups (Lebel et al. 2006, Fennell et al. 2008, Shilling et al. 2009), their implicit normativity (Shove and Walker 2007, Scrase and Smith 2009), and their tendency to stabilize and reproduce an incumbent (capitalist) political economy (Nadasdy 2003, 2007). With this paper, we would like to contribute constructively to this critical discussion. We argue that the critical concerns reflect some general conceptual shortcomings of reflexive governance designs. Although they focus on complexities of social–ecological or social–technical systems and their dynamics, both AM and TM tend to block out the political dimension of these systems (Smith and Stirling 2010) and, thus, do not adequately reflect the implications of politics for participation, experimentation, and collective learning. As others have noted before us, however, it is necessary to consider politics as a constitutive element of reflexive governance and to reflect carefully how it may play out in specific designs for participatory experimentation and learning. As a first step in this direction, we offer an analytical framework that may help to create a clearer picture of how reflexive governance designs are embedded in and intertwined with politics. This framework can be applied to systematically unveil the political blind spots of reflexive governance designs and detect ways of addressing these potential shortcomings. It is meant to stimulate efforts for making reflexive governance designs politically more reflexive and the practice of reflexive governance more effective and legitimate.

## MPX-Ecological Resil… I-Link to Dedev/Soc Ecol

**The ecological is political—Resilient ecological-social systems requires radical transformation mutually exclusive with the affirmative’s attempt to stabilize the status quo**

**Wilkinson 2012**

[Cathy Wilkinson, urban spatial planning at Stockholm Resilience Centre, Stockholm University, “Social-ecological resilience: Insights and issues for planning theory” Planning Theory May 2012 vol. 11 no. 2 148-169] Wilkinson 5

**Human–nature relations**

*How does social-ecological resilience conceptualize human–nature relations?*

Social-ecological resilience is based on the assumption that ecological systems and social-economic systems are linked (Berkes et al., 2003; Folke, 2006; Gunderson and Holling, 2002). Resilience scholars position this assumption in stark contrast to tradi­tional approaches which saw mainstream ecology exclude humans, and social science ignore the environment in its focus on human systems (Berkes et al., 2003: 9). They argue that it is only in recent decades that fields such as ecological economics, environ­mental ethics and political ecology have challenged this approach (Berkes et al., 2002). As Folke (2006: 253) explains, ‘old dominant perspectives have implicitly assumed a stable and infinitely resilient environment where resource flows could be controlled and nature would self-repair into equilibrium when human stressors were removed.’ Social-ecological resilience, by contrast, recognizes that the nature of cross-scale interactions means that human stressors cannot simply be removed as human–nature relations are increasingly complex and generate global as well as local and regional ecological impacts which cannot simply be reversed (Turner et al., 2003; Walker et al., 2009). Social-ecological resilience critiques assumptions that ignore the linked characteristic of social-ecological systems,

[it is often assumed that] if the social system performs adaptively or is well organized institutionally it will also manage the environmental resource base in a sustainable fashion. A human society may show great ability to cope with change and adapt if analyzed only through the social dimension lens. But such an adaptation may be at the expense of changes in the capacity of ecosystems to sustain the adaptation (Smit and Wandel, 2006), and may generate traps and breakpoints in the resilience of a social-ecological system (Gunderson and Holling, 2002). (Folke, 2006)

Given that social-ecological resilience is primarily concerned with the governance of ‘linked social-ecological systems’, how then do urban resilience scholars use this con­cept? In many respects it is a broad framing device. There are, however, several increas­ingly focused attempts at formalizing various analytical approaches. For example the concept of *ecosystem services* is generally used to capture the linked relationship between human systems and ecological systems. Ecosystem services (ESS) are ‘the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfill human life’ (Daily, 1997). Ecological economists have undertaken valuation studies of urban ecosystem services to increase awareness of the ecosystems on which people living in cities depend. In Stockholm, for example, research establishes the ecosystem areas required for accumulating the total emissions of CO2 generated by traffic and other anthropogenic sources, both within the city and outside of it (Jansson and Nohrstedt, 2001). Ethnographic studies of urban gardening show that social-ecological memory is critical to resilience of biodiversity and in particular polli­nation services critical for food production (Barthel et al., 2010). Methods now exist to analyse tradeoffs between different bundles of ESS (Raudsepp-Hearne et al., 2010). This is important because tradeoffs between different ESS affect the resilience of social-ecological systems (Rodriguez et al., 2006). In the USA, two Long Term Ecological Research Network urban projects, in Baltimore and Phoenix, are grappling with how to make analysable a linked ‘social-ecological system’ (SES). The difficulty of establishing a strong cross-disciplinary ‘theoretical basis or research agenda for coupling nature and human systems’ is recognized by scholars involved in this project (Redman et al., 2004) who acknowledge that ‘standard ecological theories are insufficient to address the com­plexity of human culture, behaviour, and institutions’ (Grimm and Redman, 2004: 13 as summarized in Evans, 2011: 228).

*How does this relate to the way planning theory conceptualizes human–nature relations?*

Issues of human–nature interaction are central to the very process of human settle­ment, urbanization and well-being. Ever since the establishment of the very first

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permanent settlements following the shift from nomadic to agrarian-based living, ecosystem services have been critical to the capacity of those settlements to survive and indeed thrive (Daily, 1997; Redman, 1999). Access to fresh water, reliable food and energy sources, and construction materials has been essential. Yet archaeology reveals repeated examples of urban civilizations exceeding the limits of accessible ecosystem services.

Among the more severe human-induced environmental impacts are those associated with ancient urban societies, whose dense populations, rising rates of consumption, and agricultural intensification led to regional degradation so extreme that cities were abandoned and the productive potential of entire civilizations was undermined to the point of ruin. (Grimm et al., 2000 : 572)

It is not surprising therefore that there are well-known and established bodies of research exploring human–nature relations in and of cities, from disciplines including geogra­phy, history, archaeology and of course planning. Indeed, there is a long history of attention to human–nature relations through design and planning practice. Since the emergence of town planning as a discipline, human–nature relations have been high­lighted through the Chicago School of planning, the early British town planners such as Ebenezer Howard (1850–1928), Patrick Geddes (1854–1932) and his influence on Lewis Mumford and later on through more detailed practice-based attention of how to design with nature (McHarg, 1969). From the 1970s, environmental planning emerged as a sub-discipline (Slocombe, 1993). More recently this relationship is explored through the sustainability discourse (e.g. Owens and Cowell, 2002; Rydin, 2010) and emergence of climate change.

However, when attention is turned to the planning theory literature per se, there is arguably minimal attention to the implications of ecological considerations as a pri­mary concern. This is not to say that these issues haven’t been dealt with at all, but that contributions seem to be limited compared to the extensive focus on the trajec­tory of planning theories from rationalist and critical through to collaborative and post-positivist. Areas where planning theory has specifically taken up matters of human–nature relations regard environmental ethics and political ecology. In addi­tion, in relatively recent years increasing attention is being paid to what a relational understanding of social-ecological processes means for planning theory (e.g. Hillier, 2007; Swyngedouw, 2010).

Environmental ethics is of import for planning theory because it critically informs the difficult choices and tradeoffs society must make to address serious environmental prob­lems (Beatley, 1989; Jacobs, 1995). It is not suggested that planners be the ones to decide ‘what the morally correct or ethical environmental decision is’, but that ‘they are cer­tainly in a position to put forth, and cause to be considered, key questions in arriving at an environmental ethic’ (Beatley, 1989: 26). Some of these issues are taken up in brief by subsequent planning theorists. For example, Healey (1997: 164) raises the issue of ‘moral responsibilities for those who cannot speak for themselves, other species and future generations’ and Wilson and Piper (2010: 120) suggest that climate change radi­cally extends attention to the longer-term future at the same time as ‘throwing into greater relief the problems of ensuring equitable outcomes of plans and planning decisions both now and in the future’.

Political ecology is relevant for planning theory because ‘society must consider the environmental crisis as one of ideological and political as well as ethical and moral origins’ (Harrill, 1999: 68). From this perspective, it is argued that a progressive or radical form of planning is required in order to transform ‘the social and political structures hindering sustainability’ (Harrill, 1999: 72). This transformation must occur in spite of the very present risk that as economic conditions decline so does the capacity to negotiate sustainable development gains, including ecological outcomes (Davoudi et al., 2009; Rydin, 2010) and in face of the systematic depoliticization of social-ecological governance (Swyngedouw, 2010). In an insightful piece in Ashgate’s most recent *Research Compendium to Planning Theory*, Swyngedouw (2010: 312–14) urges that planning intervention be seen as ‘irredeemably violent engagements that re-choreograph socio-natural relations and assemblages’ and as such must be accom­panied by ‘democractic agonistic struggle over the content of socio-ecological life’, struggles he argues are being replaced by ‘techno-managerial planning, expert man­agement and administration’.

## MPX-Ecol Resilience… Linear Predictions fail

**Ecological systems are complex, and resilience requires rejection of linear models because of sensitivity to initial conditions.**

**Manson 200**7

[Steven M Manson: Department of Geography, University of Minnesota, “Challenges in evaluating models of geographic complexity” Environment and Planning B: Planning and Design 2007, volume 34, pages 245 ^ 260]

3 Methodological challenges

3.1 Complex sensitivity Though the modeling of dynamic systems is difficult for reasons ranging from imple- mentational details to theoretical issues surrounding time, the modeling of complex systems entails dealing with how systems strike a balance between change and stability. Complex systems can exhibit sensitivity in the sense that large and sudden shifts in system behavior can occur in response to relatively small perturbations in inputs. This attribute of complex systems complicates model use and evaluation because sensitivity is generally assessed by determining how incremental changes in input propagate through model structure to produce varying outcomes. A model with smoothly varying relationships can be examined by parameter sweeping but more complicated models can require sophisticated test designs that identify tipping points and fine thresholds (Crosetto and Tarantola, 2001). Sensitivity in complex systems is complicated further, in a broad sense, by non- linearity, in which system outputs are not proportional to at least some portion of inputs. As Philips (2003) notes, nonlinearity often contributes to sensitivity in complex systems, but not all complex systems are nonlinear, nor are all nonlinear systems complex. This contingency is seen in early models of deterministic complexity, such as the meteorological system described by Lorenz (1963), or population boom ^ bust cycles (May, 1976). The overall state of these systems is sensitive to incremental changes in inputs, which thereby necessitate sensitivity testing sufficiently sophisticated to identify them. Similarly, linked human ^ environment systems can possess distinct thresholds that define their resilience (capacity to absorb perturbations without affecting system structure), adaptability (ability to manage resilience), and transformability (capacity to create a new structure in the face of perturbations not accommodated by system resilience (Walker et al, 2004). Complex systems can also exhibit sensitivity to initial conditions, or to the relatedly termed independence of initial conditions (Phillips, 2003). Large shifts in system behavior can result from microscale perturbations, which give rise to multiple varying attractors (values of system state, or phase variables towards which the system tends) across small shifts in inputs. Seemingly random behavior can be understood through systems of equations and strange attractors, or attractors towards which the system tends but never quite reaches (Mainzer, 1996). Complex systems can also be path dependent, in which case future states are highly dependent on and sensitive to previous states to the point of `lock-in', in which the system's path becomes fixed or constrained owing to positive feedback. One of the key barriers to the introduction of new energy systems, for example, is lock-in of the current fuel-distribution system (Grubb, 1997). Similarly, Brown and others (2005) found that agent-based models can be used to confirm our understanding of how land use is path dependent.

# Aff Answers

### Perm

**Permutation solves- combine complexity bottom up approach with federal oversight solves**

**Levy and Lichtenstein, 2011** – Levy is a Professor in Management and Marketing at UMass while Lichtenstein is an associate professor in management at UMass (David and Benyamin, “Approaching Business and the Environment with Complexity Theory”, Oxford Press, http://www.faculty.umb.edu/david\_levy/LevyLicht2011\_complexity\_chap32.pdf) //BZ

Opportunities exist here for research into the appropriate form and combination of top-down governance and bottom-up experimentation. While complexity theory has produced some general insights into the conditions needed for self-organization, these are difficult to apply and operationalize in particular circumstances, such as supply chains and local climate governance experiments. Moreover, the sustainable supply chain and industrial ecology literatures are overly reliant on material and energy flows, while neglecting the social, political, and economic structures in which these systems are embedded. This integrative perspective on bottom-up initiatives and top-down control represents a new and important understanding of complex systems. The notion that selforganization is feasible only in the absence of top-down hierarchical control reflects an inaccurate but popular understanding of complexity science that has generated a faddish wave of organizational consultants invoking complexity in a metaphorical, even mystical manner. Implicit in this approach is a free-market ideology that celebrates individual initiatives and frowns on governmental guidance. Further research can explore the degree, pace, and effectiveness of local environmental initiatives, in the context of complementary dynamics of wider, more structured coordination. If these local initiatives need protection within strategic niches, research is needed into the means of doing so without stifling the active diffusion of successful innovations into the larger system. The development of modeling tools to represent the complexities of business- environment interactions offers substantial potential for future research. Even as we recognize that limitations on long-term forecasting in complex systems, models that are well specified with realistic structures and parameters promise to generate insights into our current environmental and economic trajectory, critical thresholds, and future dangers, as well as points of leverage and intervention. A more modest goal, which is increasingly embraced by systems dynamics researchers, is to develop models using visual representations in an interactive, collaborative manner with decision-makers. These models draw on the collective expertise of professionals in a range of locations across system to capture the core dynamics and interactions at play. The purpose is not just to develop useful models, but more importantly, to encourage participants to develop an understanding of complex systems and forge consensus about likely outcomes and potential interventions. The current polarization and paralysis regarding climate change highlights the need for a broader awareness of the character and behavior complex systems at the interface of business and the environment.

### Predictions anyways

**Even if they aren’t perfect, predictions are necessary for the future**

Cowen, 2004

Professor of Economics at George Mason (Tyler, “The Epistemic Problem does not Refute Consequentialism, accessed through Cambridge Journals Online)

If we know for sure which remedy works, obviously we should apply that remedy. But imagine now that we are uncertain as to which remedy works. The uncertainty is so extreme that each remedy may cure somewhere between three hundred thousand and six hundred thousand children. Nonetheless we have a slight idea that one remedy is better than the other. That is, one remedy is slightly more likely to cure more children, with no other apparent offsetting negative effects or considerations. Despite the greater uncertainty, we still have the intuition that we should try to save as many children as possible. We should apply the remedy that is more likely to cure more children. We do not say: “We are now so uncertain about what will happen. We should pursue some goal other than trying to cure as many children as possible.” Nor would we cite greater uncertainty about longer-run events as an argument against curing the children. We have a definite good in the present (more cured children), balanced against a radical remixing of the future on both sides of the equation. The definite upfront good still stands firm. Alternatively, let us assume that our broader future suddenly became less predictable (perhaps genetic engineering is invented, which creates new and difficult-to-forecast possibilities). That still would not diminish the force of our reason for saving more children. The variance of forecast becomes larger on both sides of the equation - whether we save the children or not - and the value of the upfront lives remains. A higher variance of forecast might increase the required size of the upfront benefit (to overcome the Principle of Roughness), but it would not refute the relevance of consequences more generally. We could increase the uncertainty more, but consequentialism still will not appear counterintuitive. The remedies, rather than curing somewhere in the range of three to six hundred thousand children, might cure in the broader range of zero to all one million of the children. By all classical statistical standards, this new cure scenario involves more uncertainty than the previous case, such as by having a higher variance of possible outcomes. Yet this higher uncertainty lends little support for the view that curing the children becomes less important. We still have an imperative to apply the remedy that appears best, and is expected the cure the greater number of children. This example may appear excessively simple, but it points our attention to the non-generality of the epistemic critique. The critique appears strongest only when we have absolutely no idea about the future; this is a special rather than a general case. Simply boosting the degree of background generic uncertainty should not stop us from pursuing large upfront benefits of obvious importance.

### Predictions Good

**Even if complexity is true, we still have to make educative predictions to stop catastrophe**

Garrett, 2012

BA from Stanford, PhD from Brandeis University, rom Director of Strategic Foresight Initiative at the Atlantic Council (Banning, “In Search of Sand Piles and Butterflies”, http://www.acus.org/disruptive\_change/search-sand-piles-and-butterflies)

“Disruptive change” that produces “strategic shocks” has become an increasing concern for policymakers, shaken by momentous events of the last couple of decades that were not on their radar screens – from the fall of the Berlin Wall and the 9/11 terrorist attacks to the 2008 financial crisis and the “Arab Spring.” These were all shocks to the international system, predictable perhaps in retrospect but predicted by very few experts or officials on the eve of their occurrence. This “failure” to predict specific strategic shocks does not mean we should abandon efforts to foresee disruptive change or look at all possible shocks as equally plausible. Most strategic shocks do not “come out of the blue.” We can understand and project long-term global trends and foresee at least some of their potential effects, including potential shocks and disruptive change. We can construct alternative futures scenarios to envision potential change, including strategic shocks. Based on trends and scenarios, we can take actions to avert possible undesirable outcomes or limit the damage should they occur. We can also identify potential opportunities or at least more desirable futures that we seek to seize through policy course corrections. We should distinguish “strategic shocks” that are developments that could happen at any time and yet may never occur. This would include such plausible possibilities as use of a nuclear device by terrorists or the emergence of an airborne human-to-human virus that could kill millions. Such possible but not inevitable developments would not necessarily be the result of worsening long-term trends. Like possible terrorist attacks, governments need to try to prepare for such possible catastrophes though they may never happen. But there are other potential disruptive changes, including those that create strategic shocks to the international system, that can result from identifiable trends that make them more likely in the future—for example, growing demand for food, water, energy and other resources with supplies failing to keep pace. We need to look for the “sand piles” that the trends are building and are subject to collapse at some point with an additional but indeterminable additional “grain of sand” and identify the potential for the sudden appearance of “butterflies” that might flap their wings and set off hurricanes. Mohamed Bouazizi, who immolated himself December 17, 2010 in Sidi Bouzid, Tunisia, was the butterfly who flapped his wings and (with the “force multiplier” of social media) set off a hurricane that is still blowing throughout the Middle East. Perhaps the metaphors are mixed, but the butterfly’s delicate flapping destabilized the sand piles (of rising food prices, unemployed students, corrupt government, etc.) that had been building in Tunisia, Egypt, and much of the region. The result was a sudden collapse and disruptive change that has created a strategic shock that is still producing tremors throughout the region. But the collapse was due to cumulative effects of identifiable and converging trends. When and what form change will take may be difficult if not impossible to foresee, but the likelihood of a tipping point being reached—that linear continuation of the present into the future is increasingly unlikely—can be foreseen. Foreseeing the direction of change and the likelihood of discontinuities, both sudden and protracted, is thus not beyond our capabilities. While efforts to understand and project long-term global trends cannot provide accurate predictions, for example, of the GDPs of China, India, and the United States in 2030, looking at economic and GDP growth trends, can provide insights into a wide range of possible outcomes. For example, it is a useful to assess the implications if the GDPs of these three countries each grew at currently projected average rates – even if one understands that there are many factors that can and likely will alter their trajectories. The projected growth trends of the three countries suggest that at some point in the next few decades, perhaps between 2015 and 2030, China’s GDP will surpass that of the United States. And by adding consideration of the economic impact of demographic trends (China’s aging and India’s youth bulge), there is a possibility that India will surpass both China and the US, perhaps by 2040 or 2050, to become the world’s largest economy. These potential shifts of economic power from the United States to China then to India would likely prove strategically disruptive on a global scale. Although slowly developing, such disruptive change would likely have an even greater strategic impact than the Arab Spring. The “rise” of China has already proved strategically disruptive, creating a potential China-United States regional rivalry in Asia two decades after Americans fretted about an emerging US conflict with a then-rising Japan challenging American economic supremacy. Despite uncertainty surrounding projections, foreseeing the possibility (some would say high likelihood) that China and then India will replace the United States as the largest global economy has near-term policy implications for the US and Europe. The potential long-term shift in economic clout and concomitant shift in political power and strategic position away from the US and the West and toward the East has implications for near-term policy choices. Policymakers could conclude, for example, that the West should make greater efforts to bring the emerging (or re-emerging) great powers into close consultation on the “rules of the game” and global governance as the West’s influence in shaping institutions and behavior is likely to significantly diminish over the next few decades. The alternative to finding such a near-term accommodation could be increasing mutual suspicions and hostility rather than trust and growing cooperation between rising and established powers—especially between China and the United States—leading to a fragmented, zero-sum world in which major global challenges like climate change and resource scarcities are not addressed and conflict over dwindling resources and markets intensifies and even bleeds into the military realm among the major actors. Neither of these scenarios may play out, of course. Other global trends suggest that sometime in the next several decades, the world could encounter a “hard ceiling” on resources availability and that climate change could throw the global economy into a tailspin, harming China and India even more than the United States. In this case, perhaps India and China would falter economically leading to internal instability and crises of governance, significantly reducing their rates of economic growth and their ability to project power and play a significant international role than might otherwise have been expected. But this scenario has other implications for policymakers, including dangers posed to Western interests from “failure” of China and/or India, which could produce huge strategic shocks to the global system, including a prolonged economic downturn in the West as well as the East. Thus, looking at relatively slowly developing trends can provide foresight for necessary course corrections now to avert catastrophic disruptive change or prepare to be more resilient if foreseeable but unavoidable shocks occur. Policymakers and the public will press for predictions and criticize government officials and intelligence agencies when momentous events “catch us by surprise.” But unfortunately, as both Yogi Berra and Neils Bohr are credited with saying, “prediction is very hard, especially about the future.” One can predict with great accuracy many natural events such as sunrise and the boiling point of water at sea level. We can rely on the infallible predictability of the laws of physics to build airplanes and automobiles and iPhones. And we can calculate with great precision the destruction footprint of a given nuclear weapon. Yet even physical systems like the weather as they become more complex, become increasingly difficult and even inherently impossible to predict with precision. With human behavior, specific predictions are not just hard, but impossible as uncertainty is inherent in the human universe. As futurist Paul Saffo wrote in the Harvard Business Review in 2007, “prediction is possible only in a world in which events are preordained and no amount of actions in the present can influence the future outcome.” One cannot know for certain what actions he or she will take in the future much less the actions of another person, a group of people or a nation state. This obvious point is made to dismiss any idea of trying to “predict” what will occur in the future with accuracy, especially the outcomes of the interplay of many complex factors, including the interaction of human and natural systems. More broadly, the human future is not predetermined but rather depends on human choices at every turning point, cumulatively leading to different alternative outcomes. This uncertainty about the future also means the future is amenable to human choice and leadership. Trends analyses—including foreseeing trends leading to disruptive change—are thus essential to provide individuals, organizations and political leaders with the strategic foresight to take steps mitigate the dangers ahead and seize the opportunities for shaping the human destiny. Peter Schwartz nearly a decade ago characterized the convergence of trends and disruptive change as “inevitable surprises.” He wrote in Inevitable Surprises that “in the coming decades we face many more inevitable surprises: major discontinuities in the economic, political and social spheres of our world, each one changing the ‘rules of the game’ as its played today. If anything, there will be more, no fewer, surprises in the future, and they will all be interconnected. Together, they will lead us into a world, ten to fifteen years hence, that is fundamentally different from the one we know today. Understanding these inevitable surprises in our future is critical for the decisions we have to make today …. We may not be able to prevent catastrophe (although sometimes we can), but we can certainly increase our ability to respond, and our ability to see opportunities that we would otherwise miss.”

### Experts Good

**Expert predictions and analysis is key- good for political action and epistemological achievements**

Turner, 2001

Professor of Philosophy at U of South Florida (Stephen, “What is the problem with Experts?” accessed from JSTOR on 7/1/12)

The answer to Fish is to treat the liberal principle of neutrality not as an absolute assertion about the nature of beliefs, but as a core rule, whose application varies historically, whose main point is to establish a means of organizing the discussion of political matters, that is to say the discussion of political decisions. We can apply this to the problem of expertise as follows: it is no surprise that, in order for there to be genuine discussion in Schmitt’s sense, some things would be temporarily taken for fact, or, alternatively, some things would be left to the experts to settle. ‘Politicizing’ everything, making everything into the subject of political decisionmaking (or treating it as an analogue to political decision-making), would lose the advantages of the intellectual division of labour and make reasoned persuasion impossible. Some facts need to be taken for granted in order for there to be genuine political discussion, and some of the work of establishing the facts is, properly, delegated to experts. Indeed, to imagine a world in which such delegation did not occur would be to imagine a simpler society, at best a society of Jeffersonian yeomen, in which everyone knew pretty much what everyone else knew that was relevant to public decisionmaking. To preserve the possibility of political discussion that such societies established, it is essential to delegate to experts and grant them cognitive authority. But granting them cognitive authority is not the same as granting them some sort of absolute and unquestionable power over us. The fact that expertise goes through a process of legitimation also means that legitimacy may be withdrawn and the cognitive authority of experts may collapse, and this suggests something quite different than the idea that liberalism is a kind of self-contradiction, and also something much more interesting. We, the non-experts, decide whether claims to cognitive authority, which in political terms are requests to have their conclusions treated as neutral fact, are to be honoured. And we have, historically, changed our minds about who is ‘expert’, and what is to be treated as neutral fact. This is, so to speak, a ‘liberal’ argument about expertise. It grants that cognitive authority and the acceptance of expertise, in modern conditions, is a condition of genuine public discourse. Liberalism, in the form of the principle of neutrality, is a means to the end of the creation of the conditions for public discourse. It is a means, however, that is not given by God, or the courts, or ‘reason’, but lives in the political decisions we make to regard assertions as open to public discussion or not. Historically, liberalism established the space for public discussion by expelling religious sectarian ‘expertise’. The challenge of the present is, in part, to deal with the claims of non-religious experts to cognitive authority. There is no formula for meeting this challenge. But there is a process of legitimation and delegitimation. And it should be no surprise that this process has come to occupy more of public discourse than ever before. But the very vigour of discussion, and the ability of the public to make decisions about what claims are legitimate, belies the image of the liberal public as victim.

### Predictions Good

**Education in good predictive models is necessary to allow for individual political predictive foresight that is necessary to prevent future catastrophe.**

Kurasawa, 2004

Associate Professor of Sociology at York University (Fuyuki, “Cautionary Tales: The Global Culture of Prevention and the Work of Foresight”, Constellations Volume 11, Issue 4, December 2004)

In the twenty-first century, the lines of political cleavage are being drawn along those of competing dystopian visions. Indeed, one of the notable features of recent public discourse and socio-political struggle is their negationist hue, for they are devoted as much to the prevention of disaster as to the realization of the good, less to what ought to be than what could but must not be. The debates that preceded the war in Iraq provide a vivid illustration of this tendency, as both camps rhetorically invoked incommensurable catastrophic scenarios to make their respective cases. And as many analysts have noted, the multinational antiwar protests culminating on February 15, 2003 marked the first time that a mass movement was able to mobilize substantial numbers of people dedicated to averting war before it had actually broken out. More generally, given past experiences and awareness of what might occur in the future, given the cries of ‘never again’ (the Second World War, the Holocaust, Bhopal, Rwanda, etc.) and ‘not ever’ (e.g., nuclear or ecological apocalypse, human cloning) that are emanating from different parts of the world, the avoidance of crises is seemingly on everyone’s lips - and everyone’s conscience. From the United Nations and regional multilateral organizations to states, from non-governmental organizations to transnational social movements, the determination to prevent the actualization of potential cataclysms has become a new imperative in world affairs. Allowing past disasters to reoccur and unprecedented calamities to unfold is now widely seen as unbearable when, in the process, the suffering of future generations is callously tolerated and our survival is being irresponsibly jeopardized. Hence, we need to pay attention to what a widely circulated report by the International Commission on Intervention and State Sovereignty identifies as a burgeoning “culture of prevention,”3 a dynamic that carries major, albeit still poorly understood, normative and political implications. Rather than bemoaning the contemporary preeminence of a dystopian imaginary, I am claiming that it can enable a novel form of transnational socio-political action, a manifestation of globalization from below that can be termed preventive foresight. We should not reduce the latter to a formal principle regulating international relations or an ensemble of policy prescriptions for official players on the world stage, since it is, just as significantly, a mode of ethico-political practice enacted by participants in the emerging realm of global civil society. In other words, what I want to underscore is the work of farsightedness, the social processes through which civic associations are simultaneously constituting and putting into practice a sense of responsibility for the future by attempting to prevent global catastrophes. Although the labor of preventive foresight takes place in varying political and socio-cultural settings - and with different degrees of institutional support and access to symbolic and material resources - it is underpinned by three distinctive features: dialogism, publicity, and transnationalism. In the first instance, preventive foresight is an intersubjective or dialogical process of address, recognition, and response between two parties in global civil society: the ‘warners,’ who anticipate and send out word of possible perils, and the audiences being warned, those who heed their interlocutors’ messages by demanding that governments and/or international organizations take measures to steer away from disaster. Secondly, the work of farsightedness derives its effectiveness and legitimacy from public debate and deliberation. This is not to say that a fully fledged global public sphere is already in existence, since transnational “strong publics” with decisional power in the formal-institutional realm are currently embryonic at best. Rather, in this context, publicity signifies that “weak publics” with distinct yet occasionally overlapping constituencies are coalescing around struggles to avoid specific global catastrophes.4 Hence, despite having little direct decision-making capacity, the environmental and peace movements, humanitarian NGOs, and other similar globally-oriented civic associations are becoming significant actors involved in public opinion formation. Groups like these are active in disseminating information and alerting citizens about looming catastrophes, lobbying states and multilateral organizations from the ‘inside’ and pressuring them from the ‘outside,’ as well as fostering public participation in debates about the future. This brings us to the transnational character of preventive foresight, which is most explicit in the now commonplace observation that we live in an interdependent world because of the globalization of the perils that humankind faces (nuclear annihilation, global warming, terrorism, genocide, AIDS and SARS epidemics, and so on); individuals and groups from far-flung parts of the planet are being brought together into “risk communities” that transcend geographical borders.5 Moreover, due to dense media and information flows, knowledge of impeding catastrophes can instantaneously reach the four corners of the earth - sometimes well before individuals in one place experience the actual consequences of a crisis originating in another. My contention is that civic associations are engaging in dialogical, public, and transnational forms of ethico-political action that contribute to the creation of a fledgling global civil society existing ‘below’ the official and institutionalized architecture of international relations.6 The work of preventive foresight consists of forging ties between citizens; participating in the circulation of flows of claims, images, and information across borders; promoting an ethos of farsighted cosmopolitanism; and forming and mobilizing weak publics that debate and struggle against possible catastrophes. Over the past few decades, states and international organizations have frequently been content to follow the lead of globally-minded civil society actors, who have been instrumental in placing on the public agenda a host of pivotal issues (such as nuclear war, ecological pollution, species extinction, genetic engineering, and mass human rights violations). To my mind, this strongly indicates that if prevention of global crises is to eventually rival the assertion of short-term and narrowly defined rationales (national interest, profit, bureaucratic self-preservation, etc.), weak publics must begin by convincing or compelling official representatives and multilateral organizations to act differently; only then will farsightedness be in a position to ‘move up’ and become institutionalized via strong publics.7 Since the global culture of prevention remains a work in progress, the argument presented in this paper is poised between empirical and normative dimensions of analysis. It proposes a theory of the practice of preventive foresight based upon already existing struggles and discourses, at the same time as it advocates the adoption of certain principles that would substantively thicken and assist in the realization of a sense of responsibility for the future of humankind. I will thereby proceed in four steps, beginning with a consideration of the shifting socio-political and cultural climate that is giving rise to farsightedness today (I). I will then contend that the development of a public aptitude for early warning about global cataclysms can overcome flawed conceptions of the future’s essential inscrutability (II). From this will follow the claim that an ethos of farsighted cosmopolitanism - of solidarity that extends to future generations - can supplant the preeminence of ‘short-termism’ with the help of appeals to the public’s moral imagination and use of reason (III). In the final section of the paper, I will argue that the commitment of global civil society actors to norms of precaution and transnational justice can hone citizens’ faculty of critical judgment against abuses of the dystopian imaginary, thereby opening the way to public deliberation about the construction of an alternative world order (IV).

### Disaster Predictions Good

**Reinvigoration in preventive policies is critical to overcome complacency in face of crisis. Predictive models are necessary to prevent and mitigate disasters.**

Kurasawa, 2004

Associate Professor of Sociology at York University (Fuyuki, “Cautionary Tales: The Global Culture of Prevention and the Work of Foresight”, Constellations Volume 11, Issue 4, December 2004)

In the previous section, I described how the capacity to produce, disseminate, and receive warning signals regarding disasters on the world stage has developed in global civil society. Yet the fact remains that audiences may let a recklessness or insouciance toward the future prevail, instead of listening to and acting upon such warnings. There is no doubt that the short-sightedness and presentism are strong dynamics in contemporary society, which is enveloped by a “temporal myopia” that encourages most individuals to live in a state of chronological self-referentiality 22 whereby they screen out anything that is not of the moment. The commercial media, advertising, and entertainment industries are major contributors to this 23 “tyranny of real time” that feeds a societal addiction to the ‘live’ and the immediate while eroding the principle of farsightedness. The infamous quip attributed to Madame de Pompadour, ‘apres nous, le deluge,’ perfectly captures a sense of utter callousness about the future that represents one of presentism’s most acute manifestations. Two closely related notions underlie it: the belief that we should only concern ourselves with whether our actions, or lack thereof, have deleterious consequences visible to us in the short- to medium-term (temporally limited responsibility); and sheer indifference toward the plight of those who will come after us (generational self-centeredness). Substantively, the two are not much different because they shift the costs and risks of present-day decisions onto our descendants. “The crisis of the future is a measure of the deficiency of our societies, incapable as they are of assessing what is involved in relationships with others,” Binde writes. “This temporal myopia brings into play the same processes of denial of others as social shortsightedness. The absence of solidarity in time between generations merely reproduces selfishness 24 in space within the same generation. Thus, to the NIMBY (‘not-in-my-back- yard’) politics of the last few decades can be added the ‘not-in-my-lifetime’ or ‘not-to-my-children’ lines of reasoning. For members of dominant groups in the North Atlantic region, disasters are something for others to worry about - that is, those who are socio-economically marginal, or geographically and temporally distant. The variations on these themes are numerous. One is the oft-stated belief that prevention is a luxury that we can scarcely afford, or even an unwarranted conceit. Accordingly, by minimizing the urgency or gravity of potential threats, procrastination appears legitimate. Why squander time, energy, and resources to anticipate and thwart what are, after all, only hypothetical dangers? Why act today when, in any case, others will do so in the future? Why not limit ourselves to reacting to cataclysms if and when they occur? A ‘bad faith’ version of this argument goes even further by seeking to discredit, reject, or deny evidence pointing to upcoming catastrophes. Here, we enter into the domain of deliberate negligence and “culpable ignorance,”25 as manifest in the apathy of US Republican administrations toward climate change or the Clinton White House’s disen- genuous and belated responses to the genocides in ex-Yugoslavia and Rwanda. At another level, instrumental-strategic forms of thought and action, so pervasive in modern societies because institutionally entrenched in the state and the market, are rarely compatible with the demands of farsightedness. The calculation of the most technically efficient means to attain a particular bureaucratic or corporate objective, and the subsequent relentless pursuit of it, intrinsically exclude broader questions of long-term prospects or negative side-effects. What matters is the maximization of profits or national self-interest with the least effort, and as rapidly as possible. Growing risks and perils are transferred to future generations through a series of trade-offs: economic growth versus environmental protection, innovation versus safety, instant gratification versus future well-being. What can be done in the face of short-sightedness? Cosmopolitanism provides some of the clues to an answer, thanks to its formulation of a universal duty of care for humankind that transcends all geographical and socio-cultural borders. I want to expand the notion of cosmopolitan universalism in a temporal direction, so that it can become applicable to future generations and thereby nourish a vibrant culture of prevention. Consequently, we need to begin thinking about a farsighted cosmopolitanism, a chrono-cosmopolitics that takes seriously a sense of “intergenerational solidarity” toward human beings who will live in our wake as much as those living amidst us today.26 In the previous section, I described how the capacity to produce, disseminate, and receive warning signals regarding disasters on the world stage has developed in global civil society. Yet the fact remains that audiences may let a recklessness or insouciance toward the future prevail, instead of listening to and acting upon such warnings. There is no doubt that the short-sightedness and presentism are strong dynamics in contemporary society, which is enveloped by a “temporal myopia” that encourages most individuals to live in a state of chronological self-referentiality 22 whereby they screen out anything that is not of the moment. The commercial media, advertising, and entertainment industries are major contributors to this 23 “tyranny of real time” that feeds a societal addiction to the ‘live’ and the immediate while eroding the principle of farsightedness. The infamous quip attributed to Madame de Pompadour, ‘apres nous, le deluge,’ perfectly captures a sense of utter callousness about the future that represents one of presentism’s most acute manifestations. Two closely related notions underlie it: the belief that we should only concern ourselves with whether our actions, or lack thereof, have deleterious consequences visible to us in the short- to medium-term (temporally limited responsibility); and sheer indifference toward the plight of those who will come after us (generational self-centeredness). 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### Disaster Predictions Good

**Informative predictions are paramount to revitalizing citizenry and equipping individuals with skills, which is the only hope for public spaces that prevent future disasters.**

Kurasawa, 2004

Associate Professor of Sociology at York University (Fuyuki, “Cautionary Tales: The Global Culture of Prevention and the Work of Foresight”, Constellations Volume 11, Issue 4, December 2004)

Lastly, I contended that the work of preventive foresight can parry alarmist misappropriation or resignation by advocating a process of public deliberation that blends the principles of precaution and global justice. A farsighted politics can function through the public use of reason and the honing of the capacity for critical judgment, whereby citizens put themselves in a position to debate, evaluate, and challenge different dystopian narratives about the future and determine which ones are more analytically plausible, ethically desirable, and politically effective in bringing about a world order that is less perilous yet more just for our descendants. Many fora, ranging from local, face-to-face meetings to transnational, highly mediated discursive networks, are sowing the seeds of such a practice of participatory democracy. None of this is to disavow the international community’s rather patchy record of avoiding foreseeable calamities over the last decades, or to minimize the difficulties of implementing the kinds of global institutional reforms described above and the perils of historical contingency, presentist indifference toward the future, or alarmism and resignation. To my mind, however, this is all the more reason to pay attention to the work of preventive foresight in global civil society, through which civic associations can build up the latter’s coordination mechanisms and institutional leverage, cultivate and mobilize public opinion in distant parts of the world, and compel political leaders and national and transnational governance structures to implement certain policies. While seeking to prevent cataclysms from worsening or, better yet, from occurring in the first place, these sorts of initiatives can and must remain consistent with a vision of a just world order. Furthermore, the labor of farsightedness supports an autonomous view of the future, according to which we are the creators of the field of possibilities within which our successors will dwell. The current socio-political order, with all its short-term biases, is neither natural nor necessary. Accordingly, informed public participation in deliberative processes makes a socially self-instituting future possible, through the involvement of groups and individuals active in domestic and supranational public spaces; prevention is a public practice, and a public responsibility. To believe otherwise is, I would argue, to leave the path clear for a series of alternatives that heteronomously compromise the well-being of those who will come after us. We would thereby effectively abandon the future to the vagaries of history (‘let it unfold as it may’), the technocratic or instrumental will of official institutions (‘let others decide for us’), or to gambles about the time-lags of risks (‘let our progeny deal with their realization’). But, as I have tried to show here, this will not and cannot be accepted. Engaging in autonomous preventive struggles, then, remains our best hope. A farsighted cosmopolitanism that aims to avert crises while working toward the realization of precaution and global justice represents a compelling ethico-political project, for we will not inherit a better future. It must be made, starting with us, in the here and now.

### Predictions Good

**Predictions are useful to develop a superior framing of ideas**

**Mearsheimer, 2001** (John, professor of political science at the University of Chicago, The Tragedy of Great Power Politics, 2001 p. 8, googleprint)

As a result, all political forecasting is bound to include some error. Those who venture to predict, as I do here, should therefore proceed with humility, take care not to exhibit unwarranted confidence, and admit that hindsight is likely to reveal surprises and mistakes. Despite these hazards, social scientists should nevertheless use their theories to make predictions about the future. Making predictions helps inform policy discourse, because it helps make sense of events unfolding in the world around us. And by clarifying points of disagreement, making explicit forecasts helps those with contradictory views to frame their own ideas more clearly. Furthermore, trying to anticipate new events is a good way to test social science theories, because theorists do not have the benefit of hindsight and therefore cannot adjust their claims to fit the evidence (because it is not yet available). In short, the world can be used as a laboratory to decide which theories best explain international politics. In that spirit I employ offensive realism to peer into the future, mindful of both the benefits and the hazards of trying to predict events.

### Solves extinction

**Good models of predictions is necessary to prevent extinction – fundamentalism, ethnic conflict, climate change, disease, nuclear war can be prevented through predictive aversion and prevention.**

Kurasawa, 2004

Associate Professor of Sociology at York University (Fuyuki, “Cautionary Tales: The Global Culture of Prevention and the Work of Foresight”, Constellations Volume 11, Issue 4, December 2004)

Although farsightedness has a long history in world affairs, we can trace back the factors responsible for its present-day standing to the second half of the twentieth century. Societies emerging from the horrors and devastation of two world wars came to recognize that certain dangers (principally wars of aggression, genocide, crimes against humanity, and nuclear armageddon) needed to be averted at all costs. The international community thereby devised a number of institutional responses, such as the Charter giving birth to the United Nations, the signing of the Universal Declaration of Human Rights, and the UN Convention on the Prevention and Punishment of the Crime of Genocide. However, by paralyzing the United Nations system and fuelling a nuclear arms race, the onset and escalation of the Cold War rendered the institutional sphere largely ineffective. In response to this paralysis came the nuclear disarmament and peace movements, which were spurred on by the terrifying realization that human beings had devised the means for their own annihilation and that the two geopolitical blocs were pursuing an exterminist logic; given that human survival could no longer be entrusted to governments or multilateral institutions, citizens had to organize themselves to tackle the problem head-on. In the 1970s and 1980s, widely circulated reports from the Club of Rome and the Brundtland Commission8 combined with environmental activism brought another global threat to public attention, the prospect of ecological ruin caused by a rampant industrialism that mercilessly depleted the earth’s resources and polluted it at an unsustainably destructive pace. Yet it is since the end of the Cold War that the idea of prevention has truly come into its own in both the formally and informally organized domains of global governance. The dissolution of the bipolar stalemate between East and West opened the door to greater inter-state coordination and collaboration, perhaps most significantly at the United Nations Security Council.9 The creation of supranational judicial institutions (e.g., the International Criminal Tribunal for the former Yugoslavia and the International Criminal Court) are also signal achievements of the post-Cold War world order, for they may well have a latent deterrence effect despite the fact that they are designed to prosecute crimes against humanity ex post facto. The Rome Treaty establishing the International Criminal Court is itself part of an expanding infrastructure of multinational conferences and agreements that has come into being over the past decade or so; governments and NGOs have participated in large-scale, UN-sponsored summits that have yielded agreements or declarations incorporating strong preventive language: the Rio Summit on the environment, the Kyoto Protocol on climate change, the Inter-national Treaty to Ban Landmines, and, of most relevance for our purposes, the Declaration on the Responsibilities of the Present Generations Towards Future Generations.10 Furthermore, the unfolding of a process of globalization from below has meant that certain civil society organizations are increasingly vocal in demanding that governments, multilateral institutions and transnational corporations take preventive action or cease to engage in activities and support policies that imperil humankind. In addition, farsightedness has become a priority in world affairs due to the appearance of new global threats and the resurgence of ‘older’ ones. Virulent forms of ethno-racial nationalism and religious fundamentalism that had mostly been kept in check or bottled up during the Cold War have reasserted themselves in ways that are now all-too-familiar - civil warfare, genocide, ‘ethnic cleansing,’ and global terrorism. And if nuclear mutually assured destruction has come to pass, other dangers are filling the vacuum: climate change, AIDS and other diseases (BSE, SARS, etc.), as well as previously unheralded genomic perils (genetically modified organisms, human cloning). Collective remembrance of past atrocities and disasters has galvanized some sectors of public opinion and made the international community’s unwillingness to adequately intervene before and during the genocides in the ex-Yugoslavia and Rwanda, or to take remedial steps in the case of the spiraling African and Asian AIDS pandemics, appear particularly glaring,

### Apocalyptic Predictions Good

**Good forms of predictions are key to combat alarmism and apocalyptic scenarios.**

Kurasawa, 2004

Associate Professor of Sociology at York University (Fuyuki, “Cautionary Tales: The Global Culture of Prevention and the Work of Foresight”, Constellations Volume 11, Issue 4, December 2004)

Foremost among the possible distortions of farsightedness is alarmism, the manufacturing of unwarranted and unfounded doomsday scenarios. State and market institutions may seek to produce a culture of fear by deliberately stretching interpretations of reality beyond the limits of the plausible so as to exaggerate the prospects of impending catastrophes, or yet again, by intentionally promoting certain prognoses over others for instrumental purposes. Accordingly, regressive dystopias can operate as Trojan horses advancing political agendas or commercial interests that would otherwise be susceptible to public scrutiny and opposition. Instances of this kind of manipulation of the dystopian imaginary are plentiful: the invasion of Iraq in the name of fighting terrorism and an imminent threat of use of ‘weapons of mass destruction’; the severe curtailing of American civil liberties amidst fears of a collapse of ‘homeland security’; the neoliberal dismantling of the welfare state as the only remedy for an ideologically constructed fiscal crisis; the conservative expansion of policing and incarceration due to supposedly spiraling crime waves; and so forth. Alarmism constructs and codes the future in particular ways, producing or reinforcing certain crisis narratives, belief structures, and rhetorical conventions. As much as alarmist ideas beget a culture of fear, the reverse is no less true. If fear-mongering is a misappropriation of preventive foresight, resignation about the future represents a problematic outgrowth of the popular acknowledgment of global perils. Some believe that the world to come is so uncertain and dangerous that we should not attempt to modify the course of history; the future will look after itself for better or worse, regardless of what we do or wish. One version of this argument consists in a complacent optimism perceiving the future as fated to be better than either the past or the present. Frequently accompanying it is a self-deluding denial of what is plausible (‘the world will not be so bad after all’), or a naively Panglossian pragmatism (‘things will work themselves out in spite of everything, because humankind always finds ways to survive’).37 Much more common, however, is the opposite reaction, a fatalistic pessimism reconciled to the idea that the future will be necessarily worse than what preceded it. This is sustained by a tragic chronological framework according to which humanity is doomed to decay, or a cyclical one of the endless repetition of the mistakes of the past.

### Predictions Solv Disaster

**Predictions are necessary to prevent global disasters like climate change and nuclear war.**

Kurasawa, 2004

Associate Professor of Sociology at York University (Fuyuki, “Cautionary Tales: The Global Culture of Prevention and the Work of Foresight”, Constellations Volume 11, Issue 4, December 2004)

Moreover, keeping in mind the sobering lessons of the past century cannot but make us wary about humankind’s supposedly unlimited ability for problemsolving or discovering solutions in time to avert calamities. In fact, the historical track-record of last-minute, technical ‘quick-fixes’ is hardly reassuring. What’s more, most of the serious perils that we face today (e.g., nuclear waste, climate change, global terrorism, genocide and civil war) demand complex, sustained, long-term strategies of planning, coordination, and execution. On the other hand, an examination of fatalism makes it readily apparent that the idea that humankind is doomed from the outset puts off any attempt to minimize risks for our successors, essentially condemning them to face cataclysms unprepared. An a priori pessimism is also unsustainable given the fact that long-term preventive action has had (and will continue to have) appreciable beneficial effects; the examples of medical research, the welfare state, international humanitarian law, as well as strict environmental regulations in some countries stand out among many others. The evaluative framework proposed above should not be restricted to the critique of misappropriations of farsightedness, since it can equally support public deliberation with a reconstructive intent, that is, democratic discussion and debate about a future that human beings would freely self-determine. Inverting Foucault’s Nietzschean metaphor, we can think of genealogies of the future that could perform a farsighted mapping out of the possible ways of organizing social life. They are, in other words, interventions into the present intended to facilitate global civil society’s participation in shaping the field of possibilities of what is to come. Once competing dystopian visions are filtered out on the basis of their analytical credibility, ethical commitments, and political underpinnings and consequences, groups and individuals can assess the remaining legitimate catastrophic scenarios through the lens of genealogical mappings of the future. Hence, our first duty consists in addressing the present-day causes of eventual perils, ensuring that the paths we decide upon do not contract the range of options available for our posterity. Just as importantly, the practice of genealogically- inspired farsightedness nurtures the project of an autonomous future, one that is socially self-instituting. In so doing, we can acknowledge that the future is a human creation instead of the product of metaphysical and extra-social forces (god, nature, destiny, etc.), and begin to reflect upon and deliberate about the kind of legacy we want to leave for those who will follow us. Participants in global civil society can then take - and in many instances have already taken - a further step by committing themselves to socio-political struggles forging a world order that, aside from not jeopardizing human and environmental survival, is designed to rectify the sources of transnational injustice that will continue to inflict needless suffering upon future generations if left unchallenged.

### Futurism Good

**Future-oriented politics are key to prevent extinction from technology. Even if technological power is the cause we should explicitly plan and expose possibilities for human extinction.**

Jonas, 1996

[Hans, Former Alvin Johnson Prof. Phil. – New School for Social Research and Former Eric Voegelin Visiting Prof. – U. Munich, “Morality and Mortality: A Search for the Good After Auschwitz”, p. 108-110]

But to return to our subject: Modern megatechnology contains both of the threats we have named—that of physical annihilation and that of existential impoverishment: the former by means of its unquestionably negative potential for catastrophe (such as atomic war), the latter by means of its positive potential for manipulation. Examples of this manipulation, which can lead to our ethical powerlessness, are the automation of all work, psychological and biological behavior control, various forms of totalitarianism, and—probably most dangerous of all—the genetic reshaping of our nature. Finally, as far as environmental destruction is concerned—i.e., not a sudden nuclear apocalypse but a gradual one by means of a completely peaceful technology in the service of humanity— the physical threat itself becomes an existential one if the end result is global misery that allows only for an imperative of naked survival devoid of all feeling of ethical responsibility. With this, we return to the other desideratum for the grounding of an ethics for the future in a technological age: the factual knowledge afforded by "futurology." We said earlier that this knowledge must awaken the right feelings in us in order to motivate us to act with responsibility. A few words are appropriate here about this emotional side of a vision of the future called for by ethics. If we first think, as we cannot help but do, of the fate man has imposed on the planet, a fate staring at us out of the future, then we are right to feel a mixture of fear and guilt: fear because what we see ahead is something terrible; guilt because we are conscious of our own causal role in bringing it about. But can something frightful, which will not affect us but those who come much later, frighten us? Even watching a tragedy on the stage can do this, as we know. This analogy adds to our "fear" and anticipatory "pity" for later generations damned in advance, yet we do not have the consolation afforded by a stage drama that this is mere fiction; the reality of futurology's warning denies us that. Above all, however, its accusation that future generations are our victims makes the selfish distancing of our feelings, which something remote otherwise permits, morally impossible for us. Our horror at what the future holds cries out to us: "That must not be! We must not permit that! We must not bring that about!" An unselfish fear of what will eventuate long after us, anticipatory remorse on its account, and shame on our own account overcome us as sheer reflexes triggered by decency and by solidarity with our species. Here no metaphysical sanction is even necessary, yet it is anticipated in these reflexes and finds in those spontaneous feelings a natural ally for its demands. For this very reason the dismal conclusions of scientific futurology ought to be widely disseminated. In the end, then, it is the "ontological imperative," discussed earlier, of man's "ought-to-be," whether clearly recognized or dimly perceived, which absolutely forbids us to have the contemptible attitude of "after us the deluge." Given the validity of this imperative (which many surely can agree upon without any philosophical substantiation), the responsibility we bear because of our power becomes a compelling law. The role of power in this entire context is complicated and in part paradoxical. On the one hand, it is the cause of the catastrophe we fear; on the other, the sole means of its possible prevention. This prophylaxis demands massive application of the same knowledge which is the source of our fateful power. By struggling against the effects of this power, we are strengthening its roots. Fear of our power has taken the place of the natural euphoria that once accompanied its possession, its enjoyment, and above all its self-engendered growth. It is no longer nature, as formerly, but our power over it which now fills us with fear— for the sake of nature and for our own sakes. Our power has become our master instead of our servant. We must now gain control over it. We have not yet done so, even though our power is entirely the result of our knowledge and our will. Knowledge, will, and power are collective, and therefore control of them must also be collective: it can come only from forces within the public sector. In other words, it must be political, and that requires in the long run a broad, grass-roots consensus.

### Predictions Accurate

**Even if predictions aren’t perfect, giving up on them is ludicrous. Game theory can provide reliable models of the world**

de Mesquita  11

[Bruce Bueno de Mesquita is Silver Professor of Politics at New York University and a senior fellow at the Hoover Institution B.A. from Queens, M.A. from Michigan, PhD from Michigan, "FOX-HEDGING OR KNOWING: ONE BIG WAY TO KNOW MANY THINGS" July 18 [www.cato-unbound.org/2011/07/18/bruce-bueno-de-mesquita/fox-hedging-or-knowing-one-big-way-to-know-many-things/](http://www.cato-unbound.org/2011/07/18/bruce-bueno-de-mesquita/fox-hedging-or-knowing-one-big-way-to-know-many-things/)]

It is hard to say which is more surprising, that anyone still argues that we can predict very little or that anyone believes expertise conveys reliable judgment. Each reflects a bad habit of mind that we should overcome. It is certainly true that predictive efforts, by whatever means, are far from perfect and so we can always come up with examples of failure. But a proper assessment of progress in predictive accuracy, as Gardner and Tetlock surely agree, requires that we compare the rate of success and failure across methods of prediction rather than picking only examples of failure (or success). How often, for instance, has The Economist been wrong or right in its annual forecasts compared to other forecasters? Knowing that they did poorly in 2011 or that they did well in some other selected year doesn’t help answer that question. That is why, as Gardner and Tetlock emphasize, predictive methods can best be evaluated through comparative tournaments. Reliable prediction is so much a part of our daily lives that we don’t even notice it. Consider the insurance industry. At least since Johan de Witt (1625–1672) exploited the mathematics of probability and uncertainty, insurance companies have generally been profitable. Similarly, polling and other statistical methods for predicting elections are sufficiently accurate most of the time that we forget that these methods supplanted expert judgment decades ago. Models have replaced pundits as the means by which elections are predicted exactly because various (imperfect) statistical approaches routinely outperform expert prognostications. More recently, sophisticated game theory models have proven sufficiently predictive that they have become a mainstay of high-stakes government and business auctions such as bandwidth auctions. Game theory models have also found extensive use and well-documented predictive success on both sides of the Atlantic in helping to resolve major national security issues, labor-management disputes, and complex business problems. Are these methods perfect or omniscient? Certainly not! Are the marginal returns to knowledge over naïve methods (expert opinion; predicting that tomorrow will be just like today) substantial? I believe the evidence warrants an enthusiastic "Yes!" Nevertheless, despite the numerous successes in designing predictive methods, we appropriately focus on failures. After all, by studying failure methodically we are likely to make progress in eliminating some errors in the future. Experts are an easy, although eminently justified, target for critiquing predictive accuracy. Their failure to outperform simple statistical algorithms should come as no surprise. Expertise has nothing to do with judgment or foresight. What makes an expert is the accumulation of an exceptional quantity of facts about some place or time. The idea that such expertise translates into reliable judgment rests on the false belief that knowing “the facts” is all that is necessary to draw correct inferences. This is but one form of the erroneous linkage of correlation to causation; a linkage at the heart of current data mining methods. It is even more so an example of confusing data (the facts) with a method for drawing inferences. Reliance on expert judgment ignores their personal beliefs as a noisy filter applied to the selection and utilization of facts. Consider, for instance, that Republicans, Democrats, and libertarians all know the same essential facts about the U.S. economy and all probably desire the same outcomes: low unemployment, low inflation, and high growth. The facts, however, do not lead experts to the same judgment about what to do to achieve the desired outcomes. That requires a theory and balanced evidence about what gets us from a distressed economy to a well-functioning one. Of course, lacking a common theory and biased by personal beliefs, the experts’ predictions will be widely scattered.

### Economic Models Accurate

**Accurate predictions can be made using logic and evidence. Game theory is right 90% of the time.**

de Mesquita  11

[Bruce Bueno de Mesquita is Silver Professor of Politics at New York University and a senior fellow at the Hoover Institution B.A. from Queens, M.A. from Michigan, PhD from Michigan, "FOX-HEDGING OR KNOWING: ONE BIG WAY TO KNOW MANY THINGS" July 18 [www.cato-unbound.org/2011/07/18/bruce-bueno-de-mesquita/fox-hedging-or-knowing-one-big-way-to-know-many-things/](http://www.cato-unbound.org/2011/07/18/bruce-bueno-de-mesquita/fox-hedging-or-knowing-one-big-way-to-know-many-things/)]

Good prediction—and this is my belief—comes from dependence on logic and evidence to draw inferences about the causal path from facts to outcomes. Unfortunately, government, business, and the media assume that expertise—knowing the history, culture, mores, and language of a place, for instance—is sufficient to anticipate the unfolding of events. Indeed, too often many of us dismiss approaches to prediction that require knowledge of statistical methods, mathematics, and systematic research design. We seem to prefer “wisdom” over science, even though the evidence shows that the application of the scientific method, with all of its demands, outperforms experts (remember Johan de Witt). The belief that area expertise, for instance, is sufficient to anticipate the future is, as Tetlock convincingly demonstrated, just plain false. If we hope to build reliable predictions about human behavior, whether in China, Cameroon, or Connecticut, then probably we must first harness facts to the systematic, repeated, transparent application of the same logic across connected families of problems. By doing so we can test alternative ways of thinking to uncover what works and what doesn’t in different circumstances. Here Gardner, Tetlock, and I could not agree more. Prediction tournaments are an essential ingredient to work out what the current limits are to improved knowledge and predictive accuracy. Of course, improvements in knowledge and accuracy will always be a moving target because technology, ideas, and subject adaptation will be ongoing. Given what we know today and given the problems inherent in dealing with human interaction, what is a leading contender for making accurate, discriminating, useful predictions of complex human decisions? In good hedgehog mode I believe one top contender is applied game theory. Of course there are others but I am betting on game theory as the right place to invest effort. Why? Because game theory is the only method of which I am aware that explicitly compels us to address human adaptability. Gardner and Tetlock rightly note that people are “self-aware beings who see, think, talk, and attempt to predict each other's behavior—and who are continually adapting to each other’s efforts to predict each other’s behavior, adding layer after layer of new calculations and new complexity.” This adaptation is what game theory jargon succinctly calls “endogenous choice.” Predicting human behavior means solving for endogenous choices while assessing uncertainty. It certainly isn’t easy but, as the example of bandwidth auctions helps clarify, game theorists are solving for human adaptability and uncertainty with some success. Indeed, I used game theoretic reasoning on May 5, 2010 to predict to a large investment group’s portfolio committee that Mubarak’s regime faced replacement, especially by the Muslim Brotherhood, in the coming year. That prediction did not rely on in-depth knowledge of Egyptian history and culture or on expert judgment but rather on a game theory model called selectorate theory and its implications for the concurrent occurrence of logically derived revolutionary triggers. Thus, while the desire for revolution had been present in Egypt (and elsewhere) for many years, logic suggested that the odds of success and the expected rewards for revolution were rising swiftly in 2010 in Egypt while the expected costs were not. This is but one example that highlights what Nobel laureate Kenneth Arrow, who was quoted by Gardner and Tetlock, has said about game theory and prediction (referring, as it happens, to a specific model I developed for predicting policy decisions): “Bueno de Mesquita has demonstrated the power of using game theory and related assumptions of rational and self-seeking behavior in predicting the outcome of important political and legal processes.” Nice as his statement is for me personally, the broader point is that game theory in the hands of much better game theorists than I am has the potential to transform our ability to anticipate the consequences of alternative choices in many aspects of human interaction. How can game theory be harnessed to achieve reliable prediction? Acting like a fox, I gather information from a wide variety of experts. They are asked only for specific current information (Who wants to influence a decision? What outcome do they currently advocate? How focused are they on the issue compared to other questions on their plate? How flexible are they about getting the outcome they advocate? And how much clout could they exert?). They are not asked to make judgments about what will happen. Then, acting as a hedgehog, I use that information as data with which to seed a dynamic applied game theory model. The model’s logic then produces not only specific predictions about the issues in question, but also a probability distribution around the predictions. The predictions are detailed and nuanced. They address not only what outcome is likely to arise, but also how each “player” will act, how they are likely to relate to other players over time, what they believe about each other, and much more. Methods like this are credited by the CIA, academic specialists and others, as being accurate about 90 percent of the time based on large-sample assessments. These methods have been subjected to peer review with predictions published well ahead of the outcome being known and with the issues forecast being important questions of their time with much controversy over how they were expected to be resolved. This is not so much a testament to any insight I may have had but rather to the virtue of combining the focus of the hedgehog with the breadth of the fox. When facts are harnessed by logic and evaluated through replicable tests of evidence, we progress toward better prediction. We can all hope that government, academia, and the media will rally behind Gardner and Tetlock’s pursuit of systematic tests of alternative methods for predicting the future. Methodical tournaments of alternative methods surely will go a long way to advancing our understanding of how logic and evidence can convert mysteries into the known and knowable.

### Complexity fails

**Complexity can't draw causal relationships- if there are really thousands of actors then cause and effects can't be determined- means it fails as a theory.**

Kissane, 2007

assistant dean at the Centre d'Etudes Franco-Americain de Management, lecturer at the University of South Australia, PhD from the University of South Australia in International Relations theory (Dylan, “The possibility for theoretical revolution in international politics”, [http://works.bepress.com/dylankissane/16)//](http://works.bepress.com/dylankissane/16)//BZ)

The second major problem is what has been termed the Problem of Explanation. Essentially, this problem relates to the possibility that, in a chaotic system, almost everything is expected to occur and, in hindsight, can be explained as a direct result of chaos. Consider, for example, the example of the butterfly effect: the wings of the butterfly could incite a hurricane in the Americas or it might not incite a hurricane. Both ends are expected - in the sense that they are both possibilities that are associated with a chaotic system - but a theory that does not favour one over the other is likely to prove poor in explaining international interactions. A theory must, in the words of Kenneth Waltz, be tested by its explanative power: "success in explaining, not in predicting, is the ultimate criterion of good theory” (1997, 916). A theory within which everything and nothing can occur as a result of a single interaction would seem to fail Waltz’s test. A theoretical approach to international relations that expects that anything can occur within the system and which simultaneously cannot fully explain why such an event occurred - outside of some basic notions arising from the nature of the system - may not be much of a theory at all.

### Complexity Fails

**Complexity theory overstates its findings – can’t replace traditional science**

Morowitz, 1998

Harold, Robinson Professor of biology and natural philosophy at George Mason University (“A Closet Epistemologist,” Complexity, vol. 2, no. 2, 12/7/98, Wiley)

The firm notion emerges that empirical science commences with observations, tempered by the caveat that even the simplest observations are theory-laden to some degree. From observations or collections of observations, theories are formulated and concepts of what underlies the observations are constructed. Theory formulation is a creative part of the scientific enterprise, and we lack very certain ideas as to how this takes place. The universal requirement of all empirical science is that theories have predictions which are subject to verification or falsification by experiment. My old friend Henry Quastler, who had overlapped with Popper in Vienna, used to say to me in his best Austrian accent, “Harold, a theory must be vulnerable.” These philosophical views have served science very well in its simplicity phase when the objects of observations were well defined. In the most favorable cases they became meter readings to some large number of significant figures so that precision could enter into the testing of theories. But when we turn our attention from planetary orbits and electric oscillators to economies, ecological systems, societies and huge arrays of neurons bathing in a sea of biochemicals, the predictions lose their preciseness and the meaning of verification or falsification becomes fuzzy indeed. (Enter handwaving.) There can be no doubt that high speed computing is causing a radical change in how we do science and is altering the meaning of theory. The question arising is how we know that the “science” generated within the complexity domain is the “science” that operated from the PopperMargenau epistemology criteria and provided us the underlying understanding of nature that forms one of the bases of Western culture. How do the approaches differ? They both start with elements or agents understood in some detail and a set of interactions rules (the theory). Traditional science proceeds through logical or analytical operations to predicted results. Although the logic and mathematics may be very elaborate, the nature of the theoretical unfolding tends to be transparent. In complexity theory the intermediate operations are deep within the computer and much less transparent. Complexity theory has one other aspect that seems quite different: because of the large number of agents under study and the combinatoric nature of the interactions, the domain of possible outcomes tends to grow explosively, and pruning algorithms are included as part of the theory. This constant selection makes the unfolding even less transparent, and we are reduced to examining the outcomes with **little insight** into how they were arrived at. And finally, as noted by Hollings, the results of complexity theory to date do not give precise results but “in a qualitative sense resonate with the observable.” One of the most reassuring features of the classical scheme was the precision of prediction in many domains. The best known case, celestial mechanics, yielded very precise predictions about future paths of planetary orbits. But we now work in a domain where precise agreement is replaced by resonating with the observable in a qualitative sense. I believe that these two approaches are sufficiently far apart that we must moderate our claims and separate them from the traditional claims of science. Complexity theory is a very immature discipline, and in the vigor of our pursuit and enthusiasms for the possibilities, some **restraint must be shown.** Well, closet epistemologist that I am, why have I not solved the problems that I have set forth? It is not for lack of trying; rather it has proven much too hard a task for this editorial pen. Then again, the problem may be ten, twenty, or more years premature. I will, however, not refrain from needling my colleagues. We need more certain results or more modesty— maybe both.

### Key to policy making

**Identifying causal forces of past events helps predict the future and better enable policymakers to respond to future crises**

Walt, 2005

Prof, Kennedy School of Government @ Harvard (Stephen M., Annu. Rev. Polit. Sci. 2005. 8:23–48, pg. 31, “The Relationship Between Theory and Policy in International Relations,” http://www.iheid.ch/webdav/site/political\_science/shared/political\_science/3452/walt.pdf)

PREDICTION IR theories can also help policy makers anticipate events. By identifying the central causal forces at work in a particular era, theories offer a picture of the world and thus can provide policy makers with a better understanding of the broad context in which they are operating. Such knowledge may enable policy makers to prepare more intelligently and in some cases allow them to prevent unwanted developments. To note an obvious example, different theories of international politics offered contrasting predictions about the end of the Cold War. Liberal theories generally offered optimistic forecasts, suggesting that the collapse of communism and the spread of Western-style institutions and political forms heralded an unusually peaceful era (Fukuyama 1992, Hoffman et al. 1993, Russett 1995, Weart 2000). By contrast, realist theories of IR predicted that the collapse of the Soviet threat would weaken existing alliances (Mearsheimer 1989, Waltz 1994–1995, Walt 1997c), stimulate the formation of anti-U.S. coalitions (Layne 1993,Kupchan 2000), and generally lead to heightened international competition. Other realists foresaw a Pax Americana based on U.S. primacy (Wohlforth 1999, Brooks & Wohlforth 2000–2001), whereas scholars from different traditions anticipated either a looming “clash of civilizations” (Huntington 1997) or a “coming anarchy” arising from failed states in the developing world (Kaplan 2001). Some of these works were more explicitly theoretical than others, but each highlighted particular trends and causal relationships in order to sketch a picture of an emerging world.

### Predictions Key To Policymaking

#### **Predictions key to effective policymaking.**

Chernoff, 2005

[Harvey Picker Professor International Relations and Director of the International Relations Program at Colgate University (Fred, “The Power of International Theory: Reforging the link to foreign policy-making through scientific enquiry”, p. 9]

Even though many of these authors hope that IR theory can lead to ‘human emancipation’, their meta-theory undercuts its ability to do so. This trend in the theoretical literature in IR severs the link between IR theory and any significant ability to aid policy-makers to bring about emancipation or any other foreign policy goal. If they do not leave room for rationally grounded expectations about the future, that is, scientific-style prediction, then it will be impossible to formulate policies that can be expected to achieve various aims, including the emancipation of oppressed groups. Without the ability to say that a given action option has a higher probability than any of the other options of achieving the objective, e.g., a greater degree of emancipation of the target group, these theorists cannot recommend courses of action to achieve their desired goals. The loss of this essential capability has been largely overlooked by constructivists and reflectvists in the IR literature. All policy decisions are attempts to influence or bring about some future state of affairs. Policy-making requires some beliefs about the future, whether they are called ‘expectations’, ‘predictions’, ‘forecasts’ or ‘prognostications’. The next step in the argument is to show how such beliefs can be justified.

### Evidentiary standard

**Models reduce human error and lead to better predictions – even Tetlock’s study concludes that models can help expert predictions**

Rieber, 2004

[Steven, Professor at Georgia State University , "How Statistical Models Can Help Intelligence Analysts," http://www.allacademic.com//meta/p\_mla\_apa\_research\_citation/0/7/3/6/0/pages73607/p73607-1.php]

A related point is that the models minimize random error. Human judgment is of course imperfect, and we often fail to treat like cases alike. The statistical models are boringly consistent: they always give the same weight to the same variables. This is not to say that the models are perfect predictors. They are far from perfect, and so are human experts. But using the models reduces one source of error that many experts without the models are subject to, namely random variation in their judgments. In addition to minimizing random error, the models can help counter the types of cognitive biases which plague much expert judgment. For example, many experts tend to overpredict by large margins. One study examined the accuracy of physicians’ predictions of bacteremia (bacteria the bloodstream). 6 When the doctors judged a patient 60% likely to have bacteremia, the actual probability was 12%. And when doctors were 100% certain of a diagnosis of bacteremia, they were correct only 40% of the time. 5 See Richard E. Neustadt and Ernest R. May, Thinking in Time. New York: Free Press (1986). 6 Roy M. Poses and Michelle Anthony, “Availability, Wishful Thinking, and Physicians’ Diagnostic Judgments for Patients with Suspected Bacteremia,” Medical Decision Making, Vol. 11 (1991), pp. 159-168. 5 Predictions by a statistical model are very unlikely to consistently overpredict a type of event. That is because the models are formed on the basis of large samples of similar events – and large samples generally do not undergo sudden and radical change in their basic characteristics. So when experts use the model to supplement their own judgment, they will be less likely to overpredict. Overprediction is one sort of cognitive bias. Another is overextremity (also known as overconfidence). While overprediction involves overestimating the probability in both low and high probability judgments, overextremity means overestimating at high probabilities and underestimating at low probabilities. A set of judgments is overextreme when the judge is overconfident that likely events will occur and overconfident that unlikely events will not occur. Many experts in international affairs have been shown to exhibit overextremity bias. Over the last 20 years Philip Tetlock of UC Berkeley has asked numerous experts to make predictions about events such as the future of the Soviet Union and South Africa. 7 Over all, when experts were 90% confident that an event would occur, they were correct only 59% of the time. And when the experts were 90% confident that an event would not occur, they were correct only 78% of the time. This is a classic case of overextremity bias. Tetlock also tested the results of simple mechanical predictors. As expected, these exhibited no overextremity bias. Thus, using the model can help counter overextreme predictions. Statistical models can help experts predict more accurately. This is because the models use only the relevant variables, they assign the correct values to the variables, they base their predictions on all the data rather than just the most memorable data, they minimize random error, and are not subject to cognitive biases. There exist promising models for predicting foreign events such as civil war, interstate war, and state failure.

### Predictions Feasible

**Predictions are feasible. They can be made logically from empirical evidence.**

Chernoff, 2009

[Fred, Prof. IR and Dir. IR – Colgate U., European Journal of International Relations, “Conventionalism as an Adequate Basis for Policy-Relevant IR Theory”, 15:1, Sage]

For these and other reasons, many social theorists and social scientists have come to the conclusion that prediction is impossible. Well-known IR reflexivists like Rick Ashley, Robert Cox, Rob Walker and Alex Wendt have attacked naturalism by emphasizing the interpretive nature of social theory. Ashley is explicit in his critique of prediction, as is Cox, who says quite simply, ‘It is impossible to predict the future’ (Ashley, 1986: 283; Cox, 1987: 139, cf. also 1987: 393). More recently, Heikki Patomäki has argued that ‘qualitative changes and emergence are possible, but predictions are not’ defective and that the latter two presuppose an unjustifiably narrow notion of ‘prediction’.14 A determined prediction sceptic may continue to hold that there is too great a degree of complexity of social relationships (which comprise ‘open systems’) to allow any prediction whatsoever. Two very simple examples may circumscribe and help to refute a radical variety of scepticism. First, we all make reliable social predictions and do so with great frequency. We can predict with high probability that a spouse, child or parent will react to certain well-known stimuli that we might supply, based on extensive past experience. More to the point of IR prediction – scepticism, we can imagine a young child in the UK who (perhaps at the cinema) (1) picks up a bit of 19th-century British imperial lore thus gaining a sense of the power of the crown, without knowing anything of current balances of power, (2) hears some stories about the US–UK invasion of Iraq in the context of the aim of advancing democracy, and (3) hears a bit about communist China and democratic Taiwan. Although the specific term ‘preventative strike’ might not enter into her lexicon, it is possible to imagine the child, whose knowledge is thus limited, thinking that if democratic Taiwan were threatened by China, the UK would (possibly or probably) launch a strike on China to protect it, much as the UK had done to help democracy in Iraq. In contrast to the child, readers of this journal and scholars who study the world more thoroughly have factual information (e.g. about the relative military and economic capabilities of the UK and China) and hold some cause-and-effect principles (such as that states do not usually initiate actions that leaders understand will have an extremely high probability of undercutting their power with almost no chances of success). Anyone who has adequate knowledge of world politics would predict that the UK will not launch a preventive attack against China. In the real world, China knows that for the next decade and well beyond the UK will not intervene militarily in its affairs. While Chinese leaders have to plan for many likely — and even a few somewhat unlikely — future possibilities, they do not have to plan for various implausible contingencies: they do not have to structure forces geared to defend against specifically UK forces and do not have to conduct diplomacy with the UK in a way that would be required if such an attack were a real possibility. Any rational decision-maker in China may use some cause-and-effect (probabilistic) principles along with knowledge of specific facts relating to the Sino-British relationship to predict (P2) that the UK will not land its forces on Chinese territory — even in the event of a war over Taiwan (that is, the probability is very close to zero). The statement P2 qualifies as a prediction based on DEF above and counts as knowledge for Chinese political and military decision-makers. A Chinese diplomat or military planner who would deny that theory-based prediction would have no basis to rule out extremely implausible predictions like P2 and would thus have to prepare for such unlikely contingencies as UK action against China. A reflexivist theorist sceptical of ‘prediction’ in IR might argue that the China example distorts the notion by using a trivial prediction and treating it as a meaningful one. But the critic’s temptation to dismiss its value stems precisely from the fact that it is so obviously true. The value to China of knowing that the UK is not a military threat is significant. The fact that, under current conditions, any plausible cause-and-effect understanding of IR that one might adopt would yield P2, that the ‘UK will not attack China’, does not diminish the value to China of knowing the UK does not pose a military threat. A critic might also argue that DEF and the China example allow non-scientific claims to count as predictions. But we note that while physics and chemistry offer precise ‘point predictions’, other natural sciences, such as seismology, genetics or meteorology, produce predictions that are often much less specific; that is, they describe the predicted ‘events’ in broader time frame and typically in probabilistic terms. We often find predictions about the probability, for example, of a seismic event in the form ‘some time in the next three years’ rather than ‘two years from next Monday at 11:17 am’. DEF includes approximate and probabilistic propositions as predictions and is thus able to catagorize as a prediction the former sort of statement, which is of a type that is often of great value to policy-makers. With the help of these ‘non-point predictions’ coming from the natural and the social sciences, leaders are able to choose the courses of action (e.g. more stringent earthquake-safety building codes, or procuring an additional carrier battle group) that are most likely to accomplish the leaders’ desired ends. So while ‘point predictions’ are not what political leaders require in most decision-making situations, critics of IR predictiveness often attack the predictive capacity of IR theory for its inability to deliver them. The critics thus commit the straw man fallacy by requiring a sort of prediction in IR (1) that few, if any, theorists claim to be able to offer, (2) that are not required by policy-makers for theory-based predictions to be valuable, and (3) that are not possible even in some natural sciences.15 The range of theorists included in ‘reflexivists’ here is very wide and it is possible to dissent from some of the general descriptions. From the point of view of the central argument of this article, there are two important features that should be rendered accurately. One is that reflexivists reject explanation–prediction symmetry, which allows them to pursue causal (or constitutive) explanation without any commitment to prediction. The second is that almost all share clear opposition to predictive social science.16 The reflexivist commitment to both of these conclusions should be evident from the foregoing discussion.

### Passivity Turn

**No predictions means vote aff because the alt is useless at best.**

Chernoff, 2009

[Fred, Prof. IR and Dir. IR – Colgate U., European Journal of International Relations, “Conventionalism as an Adequate Basis for Policy-Relevant IR Theory”, 15:1, Sage]

Other reflexivist theorists reject prediction more by omission. For example, Walker and Wendt are less explicit but are still quite clear in their rejections of prediction in IR. While Walker (1993) offers a sustained critique of naturalism and the empiricist (though not empirical) approach to the social sciences, he focuses on the logic of explanation and the presuppositions of the dominant forms of theory rather than questions connected to ‘prediction’. He ignores the notion of ‘prediction’. Wendt is of course one of the principal figures in American constructivism and, like others in that group, emphasizes scientific-style explanation. But at no point does he endorse prediction. Wendt lays out his extensive metatheory in Social Theory of International Politics (1999) but barely even mentions ‘prediction’. Rationalist scholars rarely note the problem that prediction – scepticism creates for the empirical value that IR theory might have. John Mearsheimer is one of the exceptions. He observes that reflexivists hope to improve the world by making it more cooperative and peaceful, which they hold will be advanced by eliminating the ‘hegemonic discourse’ of realism. But, as Mearsheimer points out, if the reflexivists were to eliminate the hegemonic discourse, then, since they do not have any way to predict what would follow in its place, the change may be a shift from realism to fascism.12 There is a related but somewhat more radical implication, which Mearsheimer does not mention, namely that without any ability to predict in the social world, it is possible that reflexivists may succeed in creating a more institutionally oriented discourse, but that discourse might not produce any change whatever in real-world politics. If they reject causal (probabilistic) connections projected into the future between events, states of affairs, or event-types, then there is no reason to believe that any specific change will lead to any effect at all.13

### Cede the Political

**Even if some predictions prove to be wrong, out-right rejections guarantees inaction and even greater impacts to human security**

James, 2008

[Patrick, professor of International Relations in the USC College and director of USC's Center for International Studies, 2-16- “For U.S. Foreign Policy, Self-Interest Is Morality”, Real Clear Politics]

However, it isn't just important which way U.S. foreign policy shifts; it's the motivation for movement. Critics who call for an emphasis on human rights, human security or other high-sounding principles aren't thinking far enough ahead. Instead, the way forward is a pragmatic building upon the opportunities created by the wars that, for better or worse, are already in progress. This involves identifying the opportunities and pursuing them on the basis of self-interest rather than abstract moral principles. As will become apparent, this approach will create the greatest good for the most people over the longest period of time. Why not a politics of morality? The general answer is that -- with rare exceptions -- it isn't obvious what actions are morally right or wrong at the time they occur. Soviet-imposed dictatorship and South African apartheid look very bad today; yet people of good will differed for decades on what precisely to do about them. No evidence exists that the best policies will come out of any particular moral frame of reference, be it religious, secular progressive or something else. As the saying goes, the road to hell is paved with good intentions. Consider, for example, the lessons to be learned from the Carter administration's emphasis on human rights in foreign policy. One could ask just how much this policy did to produce more human rights. Remember Iran, the test case for the Carter team's new way of doing things? Three decades later, we face a leader who is attempting to dismantle nascent democracy while announcing that his country is free from homosexuality. We might mention that Mahmoud Ahmadinejad likes to talk about weapons of mass destruction as well. Of course, the Carter administration has been gone for a long time, but its petulant shift from political realism to idealism ended up producing less in the way of human rights for Iranians than virtually anything that might have been considered. The best long-term results in terms of either the national interest or moral standing are unlikely to come about through a foreign policy grounded in idealism. The path toward human freedom is best pursued by pragmatically making the most of the opportunities that come along, rather than trying to figure out the "right" thing to do. Was the Iraq war a good idea? The only sensible answer to give right now is: "Who knows?" It could be decades before the impact of this war is appreciated. What we can do now is calculate its likely effect on other pressing problems and make the most of things from the standpoint of America's national interest.

### Inaction -> Genocide

**And, inaction sanctions genocide – this is an independent reason to reject**

Willis, 1995

(Ellen, The Village Voice)

If intellectuals are more inclined to rise to the discrete domestic issue than the historic international moment, this may have less to do with the decay of the notion of international solidarity than with the decay of confidence in their ability to change the world, not to mention the decay of anything resembling a coherent framework of ideas within which to understand it. Certainly the received ideas of the left, to the extent that a left can still be said to exist, have been less than helpful as a framework for understanding the Bosnian crisis or organizing a response to it. Although the idea of American imperialism explains less and less in a world where the locus of power is rapidly shifting to a network of transnational corporations, it still fuels a strain of reflexive anti-interventionist sentiment whose practical result is paralyzed dithering in the face of genocide. Floating around "progressive" circles and reinforcing the dithering is a brand of vulgar pacifism whose defining characteristic is not principled rejection of violence but squeamish aversion to dealing with it. In the academy in particular, entrenched assumptions about identity politics and cultural relativism promote a view of the Balkan conflict as too complicated and ambiguous to allow for choosing sides. If there is no such thing as universality, if multiethnic democracy is not intrinsically preferable to ethnic separatism, if there are no clear-cut aggressors and victims but merely clashing cultures, perhaps ethnic partition is simply the most practical way of resolving those "implacable ancient rivalries."

### Paralysis Turn

**The bystander effect creates complacency in face of danger; individuals stare frozen, without their autonomy to act against atrocities. This makes extinction inevitable as individuals refuse to take action.**

Yudkowsky, 2008

Research Fellow at the Singularity Institute for Artificial Intelligence (Eliezer, “Cognitive biases potentially affecting judgment of global risks”, peer edited by the Singularity Institute, [http://singularity.org/files/CognitiveBiases.pdf)//](http://singularity.org/files/CognitiveBiases.pdf)//BZ)

My last bias comes, not from the field of heuristics and biases, but from the field of social psychology. A now-famous series of experiments by Latanée and Darley (1969) uncovered the bystander eﬀect, also known as bystander apathy, in which larger numbers of people are less likely to act in emergencies—not only individually, but collectively. 75% of subjects alone in a room, noticing smoke entering from under a door, left to report it. When three naive subjects were present, the smoke was reported only 38% of the time. A naive subject in the presence of two confederates who purposely ignored the smoke, even when the room became hazy, left to report the smoke only 10% of the time. A college student apparently having an epileptic seizure was helped 85% of the time by a single bystander and 31% of the time by five bystanders. The bystander eﬀect is usually explained as resulting from diﬀusion of responsibility and pluralistic ignorance. Being part of a group reduces individual responsibility. Everyone hopes that someone else will handle the problem instead, and this reduces the individual pressure to the point that no one does anything. Support for this hypothesis is adduced from manipulations in which subjects believe that the victim is especially dependent on them; this reduces the bystander eﬀect or negates it entirely. Cialdini (2001) recommends that if you are ever in an emergency, you single out one single bystander, and ask that person to help—thereby overcoming the diﬀusion. Pluralistic ignorance is a more subtle eﬀect. Cialdini (2001) writes: Very often an emergency is not obviously an emergency. Is the man lying in the alley a heart-attack victim or a drunk sleeping one oﬀ? . . . In times of such uncertainty, the natural tendency is to look around at the actions of others for clues. We can learn from the way the other witnesses are reacting whether the event is or is not an emergency. What is easy to forget, though, is that everybody else observing the event is likely to be looking for social evidence, too. Because we all prefer to appear poised and unflustered among others, we are likely to search for that evidence placidly, with brief, camouflaged glances at those around us. Therefore everyone is likely to see everyone else looking unruﬄed and failing to act. The bystander eﬀect is not about individual selfishness, or insensitivity to the suﬀering of others. Alone subjects do usually act. Pluralistic ignorance can explain, and individual selfishness cannot explain, subjects failing to react to a room filling up with smoke. In experiments involving apparent dangers to either others or the self, subjects placed with nonreactive confederates frequently glance at the nonreactive confederates. I am sometimes asked: “If 〈existential risk X〉 is real, why aren’t more people doing something about it?” There are many possible answers, a few of which I have touched on here. People may be overconfident and over-optimistic. They may focus on overly specific scenarios for the future, to the exclusion of all others. They may not recall any past extinction events in memory. They may overestimate the predictability of the past, and hence underestimate the surprise of the future. They may not realize the diﬃculty of preparing for emergencies without benefit of hindsight. They may prefer philanthropic gambles with higher payoﬀ probabilities, neglecting the value of the stakes. They may conflate positive information about the benefits of a technology as negative information about its risks. They may be contaminated by movies where the world ends up being saved. They may purchase moral satisfaction more easily by giving to other charities. Or the extremely unpleasant prospect of human extinction may spur them to seek arguments that humanity will not go extinct, without an equally frantic search for reasons why we would. But if the question is, specifically, “Why aren’t more people doing something about it?”, one possible component is that people are asking that very question—darting their eyes around to see if anyone else is reacting to the emergency, meanwhile trying to appear poised and unflustered. If you want to know why others aren’t responding to an emergency, before you respond yourself, you may have just answered your own question.

### Predictions Solve Agency

**Predictions avoid a state of permanent emergency. They allow us to reclaim our agency from passivity.**

Bindé, 2000

[Jérôme, Dir. Analysis and Forecasting Office – UNESCO, Public Culture, “Toward an Ethics of the Future”, 12:1, Project Muse]

An ethics of the future is not an ethics in the future. If tomorrow is always too late, then today is often already very late. The disparities between North and South, and increasingly between North and North and between South and South, the growing rift within the very heart of societies, population growth, the threat of an ecological crisis on a planetary scale, and the way societies have lost control and surrendered to the hands of "anonymous masters" all call for a new paradoxical form of emergency, the emergency of the long term. To adopt, as quickly as possible, a constructive and preventive attitude means preserving future generations from the fever of immediacy, from reactive passivity, from refuge in artificial or virtual illusory paradises, and from omnipotent emergency. Through a forward-looking approach, we can be in a position to offer generations to come what we are deprived of today--a future. Institutions have the power to forecast or not to forecast. This is an awesome responsibility. By choosing not to forecast, they choose to postpone indefinitely their much needed long-term action for the sake of short-term emergency: They condemn themselves, literally, to passivity, dependency, and, ultimately, to obsolescence and nonexistence. By choosing to forecast and by refusing to become purely reactive agents, they will not only preserve their institutional independence but also send a strong message to other policymakers and decisionmakers worldwide that the first object of policy, and its first responsibility, is the future. Max Weber justly warned that "the proper business of the politician is the future and his responsibility before the future." The failure to use foresight, in other words, is not just a benign failure of intelligence: It is a culpable neglect of future generations. Is it not therefore surprising that, once foresight has been applied, once an issue has been recognised as a policy priority by all parties concerned, once international instruments have been signed that declare the commitment to act on this [End Page 56] foresight, we should fail so miserably to take the appropriate measures? Take development aid: In 1974, developed countries solemnly agreed to dedicate 0.7 percent of their GDP to development aid; nearly a quarter of a century later, in 1997, they contribute 0.22 percent of their GDP to development aid, and one superpower dedicates only 0.09 percent to it. 5 Take the issue of the global environment: Seven years after the 1992 Earth Summit in Rio, Agenda 21 remains, for the greater part, a dead letter, and the promising but timid advances made at the Kyoto Summit have since been all but forgotten. In both instances, foresight was exerted and solemn oaths taken to act on this foresight, in order to remedy pressing problems. In both instances, action has been delayed, and problems have been allowed to become more pressing. How long can we afford the luxury of inactivity? An ethics of the future, if it remains an ethics in the future, is an injustice committed against all generations, present and future. To paraphrase a common saying, the future delayed is the future denied.

### Predictions Solv Existential Risk

**Predictions necessary to prevent true existential risk – can't just theorize about complexity**

**Yudkowsky, 2008** - Research Fellow at the Singularity Institute for Artificial Intelligence (Eliezer, “Cognitive biases potentially affecting judgment of global risks”, peer edited by the Singularity Institute, [http://singularity.org/files/CognitiveBiases.pdf)/](http://singularity.org/files/CognitiveBiases.pdf)//BZ)

Thinking about existential risks falls prey to all the same fallacies that prey upon thinking-in-general. But the stakes are much, much higher. A common result in heuristics and biases is that oﬀering money or other incentives does not eliminate the bias. Kachelmeier and Shehata (1992) oﬀered subjects living in the People’s Republic of China the equivalent of three months’ salary. The subjects in these experiments don’t make mistakes on purpose; they make mistakes because they don’t know how to do better. Even if you told them the survival of humankind was at stake, they still would not thereby know how to do better. It might increase their need for closure, causing them to do worse. It is a terribly frightening thing, but people do not become any smarter, just because the survival of humankind is at stake. In addition to standard biases, I have personally observed what look like harmful modes of thinking specific to existential risks. The Spanish flu of 1918 killed 25-50 million people. World War II killed 60 million people. 10 is the order of the largest catastrophes in humanity’s written history. Substantially larger numbers, such as 500 million deaths, and especially qualitatively diﬀerent scenarios such as the extinction of the entire human species, seem to trigger a diﬀerent mode of thinking—enter into a “separate magisterium”. People who would never dream of hurting a child hear of an existential risk, and say, “Well, maybe the human species doesn’t really deserve to survive.” There is a saying in heuristics and biases that people do not evaluate events, but descriptions of events—what is called non-extensional reasoning. The extension of humanity’s extinction includes the death of yourself, of your friends, of your family, of your loved ones, of your city, of your country, of your political fellows. Yet people who would take great oﬀense at a proposal to wipe the country of Britain from the map, to kill every member of the Democratic Party in the U.S., to turn the city of Paris to glass—who would feel still greater horror on hearing the doctor say that their child had cancer— these people will discuss the extinction of humanity with perfect calm. “Extinction of humanity”, as words on paper, appears in fictional novels, or is discussed in philosophy books—it belongs to a diﬀerent context than the Spanish flu. We evaluate descriptions of events, not extensions of events. The cliché phrase end of the world invokes the magisterium of myth and dream, of prophecy and apocalypse, of novels and movies. The challenge of existential risks to rationality is that, the catastrophes being so huge, people snap into a diﬀerent mode of thinking. Human deaths are suddenly no longer bad, and detailed predictions suddenly no longer require any expertise, and whether the story is told with a happy ending or a sad ending is a matter of personal taste in stories.

### Threat Turn

**Turn—rejecting strategic predictions of threats makes them inevitable—decision makers will rely on preconceived conceptions of threat rather than the more qualified predictions of analysts**

**Fitzsimmons, 2007**

[Michael, Washington DC defense analyst, “The Problem of Uncertainty in Strategic Planning”, Survival, Winter 06-07, online]

But handling even this weaker form of uncertainty is still quite challeng- ing. If not sufficiently bounded, a high degree of variability in planning factors can exact a significant price on planning. The complexity presented by great variability strains the cognitive abilities of even the most sophisticated decision- makers.15 And even a robust decision-making process sensitive to cognitive limitations necessarily sacrifices depth of analysis for breadth as variability and complexity grows. It should follow, then, that in planning under conditions of risk, variability in strategic calculation should be carefully tailored to available analytic and decision processes. Why is this important? What harm can an imbalance between complexity and cognitive or analytic capacity in strategic planning bring? Stated simply, where analysis is silent or inadequate, the personal beliefs of decision-makers fill the void. As political scientist Richard Betts found in a study of strategic sur- prise, in ‘an environment that lacks clarity, abounds with conflicting data, and allows no time for rigorous assessment of sources and validity, ambiguity allows intuition or wishfulness to drive interpretation ... The greater the ambiguity, the greater the impact of preconceptions.’16 The decision-making environment that Betts describes here is one of political-military crisis, not long-term strategic planning. But a strategist who sees uncertainty as the central fact of his environ- ment brings upon himself some of the pathologies of crisis decision-making. He invites ambiguity, takes conflicting data for granted and substitutes a priori scepticism about the validity of prediction for time pressure as a rationale for discounting the importance of analytic rigour. It is important not to exaggerate the extent to which data and ‘rigorous assessment’ can illuminate strategic choices. Ambiguity is a fact of life, and scepticism of analysis is necessary. Accordingly, the intuition and judgement of decision-makers will always be vital to strategy, and attempting to subordinate those factors to some formulaic, deterministic decision-making model would be both undesirable and unrealistic. All the same, there is danger in the opposite extreme as well. Without careful analysis of what is relatively likely and what is relatively unlikely, what will be the possible bases for strategic choices? A decision-maker with no faith in prediction is left with little more than a set of worst-case scenarios and his existing beliefs about the world to confront the choices before him. Those beliefs may be more or less well founded, but if they are not made explicit and subject to analysis and debate regarding their application to particular strategic contexts, they remain only beliefs and premises, rather than rational judgements. Even at their best, such decisions are likely to be poorly understood by the organisations charged with their implementation. At their worst, such decisions may be poorly understood by the decision-makers themselves.

### AT: Tetlock

**Tetlock doesn’t indict all predictions, just those that are made by pundits without evidence**

Menand, 2005

[Louis, The New Yorker, 10/5, lexis]

It was no news to Tetlock, therefore, that experts got beaten by formulas. But he does believe that he discovered something about why some people make better forecasters than other people. It has to do not with what the experts believe but with the way they think. Tetlock uses Isaiah Berlin's metaphor from Archilochus, from his essay on Tolstoy, "The Hedgehog and the Fox," to illustrate the difference. He says: Low scorers look like hedgehogs: thinkers who "know one big thing," aggressively extend the explanatory reach of that one big thing into new domains, display bristly impatience with those who "do not get it," and express considerable confidence that they are already pretty proficient forecasters, at least in the long term. High scorers look like foxes: thinkers who know many small things (tricks of their trade), are skeptical of grand schemes, see explanation and prediction not as deductive exercises but rather as exercises in flexible "ad hocery" that require stitching together diverse sources of information, and are rather diffident about their own forecasting prowess. A hedgehog is a person who sees international affairs to be ultimately determined by a single bottom-line force: balance-of-power considerations, or the clash of civilizations, or globalization and the spread of free markets. A hedgehog is the kind of person who holds a great-man theory of history, according to which the Cold War does not end if there is no Ronald Reagan. Or he or she might adhere to the "actor-dispensability thesis," according to which Soviet Communism was doomed no matter what. Whatever it is, the big idea, and that idea alone, dictates the probable outcome of events. For the hedgehog, therefore, predictions that fail are only "off on timing," or are "almost right," derailed by an unforeseeable accident. There are always little swerves in the short run, but the long run irons them out. Foxes, on the other hand, don't see a single determining explanation in history. They tend, Tetlock says, "to see the world as a shifting mixture of self-fulfilling and self-negating prophecies: self-fulfilling ones in which success breeds success, and failure, failure but only up to a point, and then self-negating prophecies kick in as people recognize that things have gone too far." Tetlock did not find, in his sample, any significant correlation between how experts think and what their politics are. His hedgehogs were liberal as well as conservative, and the same with his foxes. (Hedgehogs were, of course, more likely to be extreme politically, whether rightist or leftist.) He also did not find that his foxes scored higher because they were more cautious-that their appreciation of complexity made them less likely to offer firm predictions. Unlike hedgehogs, who actually performed worse in areas in which they specialized, foxes enjoyed a modest benefit from expertise. Hedgehogs routinely over-predicted: twenty per cent of the outcomes that hedgehogs claimed were impossible or nearly impossible came to pass, versus ten per cent for the foxes. More than thirty per cent of the outcomes that hedgehogs thought were sure or near-sure did not, against twenty per cent for foxes. The upside of being a hedgehog, though, is that when you're right you can be really and spectacularly right. Great scientists, for example, are often hedgehogs. They value parsimony, the simpler solution over the more complex. In world affairs, parsimony may be a liability-but, even there, there can be traps in the kind of highly integrative thinking that is characteristic of foxes. Elsewhere, Tetlock has published an analysis of the political reasoning of Winston Churchill. Churchill was not a man who let contradictory information interfere with his idees fixes. This led him to make the wrong prediction about Indian independence, which he opposed. But it led him to be right about Hitler. He was never distracted by the contingencies that might combine to make the elimination of Hitler unnecessary. Tetlock also has an unscientific point to make, which is that "we as a society would be better off if participants in policy debates stated their beliefs in testable forms"-that is, as probabilities-"monitored their forecasting performance, and honored their reputational bets." He thinks that we're suffering from our primitive attraction to deterministic, overconfident hedgehogs. It's true that the only thing the electronic media like better than a hedgehog is two hedgehogs who don't agree. Tetlock notes, sadly, a point that Richard Posner has made about these kinds of public intellectuals, which is that most of them are dealing in "solidarity" goods, not "credence" goods. Their analyses and predictions are tailored to make their ideological brethren feel good-more white swans for the white-swan camp. A prediction, in this context, is just an exclamation point added to an analysis. Liberals want to hear that whatever conservatives are up to is bound to go badly; when the argument gets more nuanced, they change the channel. On radio and television and the editorial page, the line between expertise and advocacy is very blurry, and pundits behave exactly the way Tetlock says they will. Bush Administration loyalists say that their predictions about postwar Iraq were correct, just a little off on timing; pro-invasion liberals who are now trying to dissociate themselves from an adventure gone bad insist that though they may have sounded a false alarm, they erred "in the right direction"-not really a mistake at all.

### AT Tetlock

**They misread Tetlock—his argument is just that you should rationally weigh costs and benefits**

Tetlock, 2005

[Philip, psychologist, Expert Political Judgement, http://www.pupress.princeton.edu/chapters/s7959.html]

Chapters 2 and 3 explore correspondence indicators. Drawing on the literature on judgmental accuracy, I divide the guiding hypotheses into two categories: those rooted in radical skepticism, which equates good political judgment with good luck, and those rooted in meliorism, which maintains that the quest for predictors of good judgment, and ways to improve ourselves, is not quixotic and there are better and worse ways of thinking that translate into better and worse judgments. Chapter 2 introduces us to the radical skeptics and their varied reasons for embracing their counterintuitive creed. Their guiding precept is that, although we often talk ourselves into believing we live in a predictable world, we delude ourselves: history is ultimately one damned thing after another, a random walk with upward and downward blips but devoid of thematic continuity. Politics is no more predictable than other games of chance. On any given spin of the roulette wheel of history, crackpots will claim vindication for superstitious schemes that posit patterns in randomness. But these schemes will fail in cross-validation. What works today will disappoint tomorrow.34 Here is a doctrine that runs against the grain of human nature, our shared need to believe that we live in a comprehensible world that we can master if we apply ourselves.35 Undiluted radical skepticism requires us to believe, really believe, that when the time comes to choose among controversial policy options--to support Chinese entry into the World Trade Organization or to bomb Baghdad or Belgrade or to build a ballistic missile defense--we could do as well by tossing coins as by consulting experts.36 Chapter 2 presents evidence from regional forecasting exercises consistent with this debunking perspective. It tracks the accuracy of hundreds of experts for dozens of countries on topics as disparate as transitions to democracy and capitalism, economic growth, interstate violence, and nuclear proliferation. When we pit experts against minimalist performance benchmarks--dilettantes, dart-throwing chimps, and assorted extrapolation algorithms--we find few signs that expertise translates into greater ability to make either "well-calibrated" or "discriminating" forecasts. Radical skeptics welcomed these results, but they start squirming when we start finding patterns of consistency in who got what right. Radical skepticism tells us to expect nothing (with the caveat that if we toss enough coins, expect some streakiness). But the data revealed more consistency in forecasters' track records than could be ascribed to chance. Meliorists seize on these findings to argue that crude human-versus-chimp comparisons mask systematic individual differences in good judgment. Although meliorists agree that skeptics go too far in portraying good judgment as illusory, they agree on little else. Cognitive-content meliorists identify good judgment with a particular outlook but squabble over which points of view represent movement toward or away from the truth. Cognitive-style meliorists identify good judgment not with what one thinks, but with how one thinks. But they squabble over which styles of reasoning--quick and decisive versus balanced and thoughtful--enhance or degrade judgment. Chapter 3 tests a multitude of meliorist hypotheses--most of which bite the dust. Who experts were--professional background, status, and so on--made scarcely an iota of difference to accuracy. Nor did what experts thought--whether they were liberals or conservatives, realists or institutionalists, optimists or pessimists. But the search bore fruit. How experts thought--their style of reasoning--did matter. Chapter 3 demonstrates the usefulness of classifying experts along a rough cognitive-style continuum anchored at one end by Isaiah Berlin's prototypical hedgehog and at the other by his prototypical fox.37 The intellectually aggressive hedgehogs knew one big thing and sought, under the banner of parsimony, to expand the explanatory power of that big thing to "cover" new cases; the more eclectic foxes knew many little things and were content to improvise ad hoc solutions to keep pace with a rapidly changing world. Treating the regional forecasting studies as a decathlon between rival strategies of making sense of the world, the foxes consistently edge out the hedgehogs but enjoy their most decisive victories in long-term exercises inside their domains of expertise. Analysis of explanations for their predictions sheds light on how foxes pulled off this cognitive-stylistic coup. The foxes' self-critical, point-counterpoint style of thinking prevented them from building up the sorts of excessive enthusiasm for their predictions that hedgehogs, especially well-informed ones, displayed for theirs. Foxes were more sensitive to how contradictory forces can yield stable equilibria and, as a result, "overpredicted" fewer departures, good or bad, from the status quo. But foxes did not mindlessly predict the past. They recognized the precariousness of many equilibria and hedged their bets by rarely ruling out anything as "impossible." These results favor meliorism over skepticism--and they favor the pro-complexity branch of meliorism, which proclaims the adaptive superiority of the tentative, balanced modes of thinking favored by foxes,38 over the pro-simplicity branch, which proclaims the superiority of the confident, decisive modes of thinking favored by hedgehogs.39 These results also domesticate radical skepticism, with its wild-eyed implication that experts have nothing useful to tell us about the future beyond what we could have learned from tossing coins or inspecting goat entrails. This tamer brand of skepticism--skeptical meliorism--still warns of the dangers of hubris, but it allows for how a self-critical, dialectical style of reasoning can spare experts the big mistakes that hammer down the accuracy of their more intellectually exuberant colleagues.

### Perm Solvency

#### Permutation solves—complexity can be incorporated in the affirmative’s policy process.

Ruth and Coelho 2006

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“Managing the Interrelations Among Urban Infrastructure, Population, and Institutions” Forschungszentrum Nachhaltigkeit (artec-paper Nr. 136)] Ruth Coelho 9b

Traditionally, city planning has focused on spatial planning, housing, transport, energy, and water systems to individually and specifically address the drivers of urban change discussed in Section 2 above. As the interrelations among individual drivers are becoming increasingly apparent, focus has shifted to integration of planning and management of land use with physical infrastructure, sociocultural and economic issues, as well as environmental quality. In the process, insights from complexity theory have been proposed as relevant to understand and guide the development of cities. Those insights are used in two different, though related ways.

First, there is the study of cities as complex systems, where the macrobehaviors of cities are modeled and investigated much like the macrobehaviors of chemical or biological systems. The relevant modern conceptualizations of complexity used in this research originate in the works of Illia Prigogine and his co-workers (see, e.g., Prigogine 1980), who have studied open systems – typically physical or chemical systems that were characterized by the exchange of mass and energy across system boundaries. Here, non-equilibrium thermodynamics provided crucial insights into the behavior of many such systems. As these systems are exposed to changes in energy flows from the outside, structures emerge inside that help dissipate those flows. When stability thresholds are exceeded, the systems may experience a transition to a new structure which, in turn, possesses its own limited development potential (Nicolis and Prigogine 1977).

The early work on silicones and other materials was soon extended to address the formation of and change in the structure of biological systems, from cells to entire ecosystems (Prigogine et al. 1972). For example, Eric Schneider (1988, p. 116) described “life itself [a]s a product of the thermodynamic histories of the global ecosystem as it evolved from chemical elements and, through energy flux transformations, developed useful genetic materials that reproduce and metabolize into highly organized systems through stepwise energy transformations.”

The appeal of complexity theory as a unifying framework to explain system change was further extended, at least by analogy, to shed light on economic growth and development (for a review see Ruth 2005). Some have begun to build computer simulation models of social and economic systems which describe them explicitly as non-linear, open, self-organizing systems. Peter Allen (1997), a former student of Prigogine’s, has been among the first to do so for urban systems. The urban dynamics simulation models of Jay Forrester (1969), though not explicitly guided by complexity theory, do recognize the importance of system openness, non-linearities and time lags. His models focus on the interplay of physical urban infrastructure, economic development, and pollution in a way that is closely related to the notion of urban metabolism discussed above.

While much of the work on complex systems behavior has been descriptive or simulation oriented, lessons from complex systems analysis are slowly beginning to inform policy and investment decision making. If systems, such as cities, are indeed best described as open, diverse in structure, and varied in interacting components; if furthermore, many of these interactions are non-linear and time-lagged; and if the components themselves are complex systems nested within other complex systems, then – so the argument goes – a complex systems approach is needed to understand and guide their behavior (Rotmans and van Asselt 2000, Rotmans 2006). Complex systems analysis, thus, has rapidly evolved from a descriptive into a prescriptive endeavor. In doing so, it has encountered inherent challenges when trying to provide “management advice” on the basis of a world view that emphasizes non-deterministic system behavior.

As a consequence of complexity, novelty and surprise are unavoidable features of system development (Funtowicz and Ravetz 1991). One approach to dealing with complexity and uncertainty in a pragmatic fashion is to require that different perspectives on the various system elements and their interactions are provided by different stakeholders from a range of scientific, public, private, and non-profit communities (Bond 1998, Hulme and Taylor 2000). Several of the integrated urban assessments discussed above have attempted to provide a rich, multidisciplinary perspective, informed – and on occasion guided – by insights from many different stakeholders. Yet, managing the contributions from a large and diverse set of stakeholders has itself become a complex management task. The scarcity of resources for those projects and their inherent short duration of

usually only one to five years have largely prevented them from becoming institutionalized to a point where they can have any long-reaching policy impact. As a consequence, the extent of stakeholder dialog and involvement is frequently curtailed to keep projects within resource constraints.

A second means of capturing a wide range of influences on the behavior of urban systems it to craft scenarios that are consistent both internally and broadly with respect to the contributed viewpoints on the strength and role of outside influences on the system and drivers within the system. Frequently, contrasting scenarios represent alternate viewpoints of stakeholders. Playing those scenarios out – often with the help of computer models – and interpreting their consequences across sectors and across time can provide valuable input for institutional learning. Furthermore, to the extent that the primary elements of an urban system are formally modeled, the quantitative (and qualitative) outputs from simulation exercises can be used to inform feedbacks between system response and intervention through investment and policy choice, as already indicated in Figure 2 above.

Computer models of complex urban dynamics can improve, iteratively, the knowledge of stakeholders, and with that knowledge perhaps improve decision makers’ ability to influence those dynamics. It is in this sense that adaptive management (Holling 1978, Gunderson et al. 1995) can be a key element in problem solving. However, an added challenge in urban planning and management that is not present in many of the other areas to which adaptive management has been applied, lies in the lumpiness and irreversibility of

infrastructure investments. Long lead times and life times of projects in many ways prevent adaptation – once an urban highway system is put in place or an underground sewer network has been laid, changes are virtually impossible. Here it becomes even more important to explore, in structured and quantifiable ways, the potential future implications of current investment and policy choices. Implementing more anticipatory management (Ruth 2006b) is proving to be even more of a challenge than establishing adaptive management as a guiding principle for investment and policy making.

### Network Theory Fails

#### Reject their theory of networks—it’s methodologically restrictive and ignores political events.

Geels 2010

[Frank W. Geels, Science and Technology Policy Research, University of Sussex “Ontologies, socio-technical transitions (to sustainability), and the multi-level perspective” Research Policy 39 (2010) 495–510] Geels 16

The MLP has been inspired by relationism, e.g. via Rip and Kemp¶ (1998) who draw on actor-network theory (ANT) notions such as¶ heterogeneous configuration, a socio-technical focus where social¶ and technical elements co-construct each other, and an emphasis¶ on ongoing processes, linkages and alignments. Also some¶ of Geels and Schot’s (2007) transition pathways (reconfiguration¶ and dealignment/realigmment) build on these kinds of dynamic¶ notions.

Despite these inspirations, scholars working on the MLP have¶ not actively pursued further crossovers with ANT. The main reason¶ is that ANT has a flat (or folded) ontology, which denies the¶ analytical usefulness of ‘levels’. Within ANT it is therefore difficult¶ to investigate multi-level relations between niche-innovations,¶ regimes and landscapes.14 One might argue that ANT could be positioned¶ at the MLP’s niche-level. ANT’s emphasis on innovations¶ ‘in-the-making’ and the focus on what actors do in practices tomake¶ heterogeneous configurations work has some fit with the fluidity,¶ uncertainty and experimental projects within technological niches.¶ But ANT-scholars might perceive such an argument as pushing their¶ views into an analytical straightjacket. Their view on coordination¶ (which arises from transactions and circulations between local practices),¶ for instance, might sit uncomfortably with the MLP’s view¶ on coordination via rules, routines and structures. For the topic of¶ socio-technical transitions, the problem with ANT is that its focus¶ on innovations ‘in-the-making’ precludes attention to what happens¶ with innovations when they are made and have stabilized.¶ Van Lente (1993: 31) summarises this problem as follows:¶ “Their limitation is that the analysis terminates as soon as a regularity¶ or pattern is established. Authors explain the outcomes¶ of interactions or translations, but forget that as soon as these¶ outcomes are produced, they continue to exist. Their analyses¶ tend to stop as soon as an artefact, an organization or other¶ socio-technical outcome starts to have a ‘life of its own”’.¶ ANT thus pays less attention to the diffusion of technologies,¶ their sedimentation into background structures and the emergence¶ of stable patterns. Because ANT focuses on what actors do, it gives¶ less attention to the sedimented patterns in which they are embedded¶ and the structures that actors take for granted (e.g. rules and¶ routines). This criticism applies less to other relationist approaches¶ such as practice theories, in particular Shove’s work on consumer¶ practices that analyses how existing routines, meanings and technologies¶ influence activities in ‘everyday life’.

The micro-focus, flat ontology and complexifying epistemology¶ (with suspicions towards analytical models) clearly complicate¶ 14 Genus and Coles (2008) seem unaware of this problem when they suggest that¶ actor-network theory should be integrated in the MLP.¶ crossovers of relationism with the MLP.15 Nevertheless, ANT does¶ have notions of networks with varying degrees of stability. Callon¶ et al. (1992), for instance, suggests that techno-economic networks¶ are more stable if they are longer, more complete/chained¶ and convergent. This view creates opportunities for investigating¶ interactions between stable networks (e.g. existing socio-technical¶ systems) and emerging networks (e.g. niche-innovations). Despite¶ initial suggestions to develop such an “actor-network theory at a¶ meso-level” (Geels, 2006: 450), much conceptual work remains to¶ be done to develop such a model.16 While crossovers to the MLP¶ may be possible, relationism forms an intriguing ontology by itself¶ that can perhaps develop alternative ways of investigating transitions.

### Alt Fails—Resilience Context

#### The negative attempts to apply abstract theories of resilience to transportation planning—theoretical synthesis fails.

Wilkinson 2012

[Cathy Wilkinson, urban spatial planning at Stockholm Resilience Centre, Stockholm University, “Social-ecological resilience: Insights and issues for planning theory” Planning Theory May 2012 vol. 11 no. 2 148-169] Wilkinson 2

According to Friedmann, the task of translation is ‘to translate concepts and knowledges generated in other fields into our own domain, and to render them accessible and useful for planning and its practices’ (2008: 248). Other scholars have previously identified *translation* as a critical role for planning theory (see for example Huxley and Yiftachel, 2000: 338). Indeed, the history of planning theory is full of such translations, drawing from a wide range of sources. As Friedmann explains,

I see planning theorists actively engaged in mining expeditions into the universe of knowledge, on the lookout for concepts and ideas they believe to be of interest in planning education. Their specific contribution to theory is to return from these expeditions to home base and translate their discoveries into the language of planning where they will either take root or be unceremoniously forgotten. (Friedmann, 2008: 254)

The theoretical challenge of translating concepts from other disciplines into planning requires the following: ‘reasonable knowledge of both the source and the target domains, sufficient to enable a pertinent abstraction of key relational characteristics from within each; an effort to draw out and explicate key similarities and analogies; an effort to abstract and elucidate essential relational features, and also an attempt to explore the abstractions with relation to other theoretical work in the target domain’ (Chettiparamb, 2006: 78). This research is generally guided by this framework, although given the pre­liminary nature of this exploration it provides an overview rather than going into any depth when exploring relational features, instead focusing on identifying key issues and future research agendas. The source domain here is social-ecological resilience. The tar­get domain is planning theory.

This research is based on a comprehensive literature review of both fields. Three key underlying assumptions of social-ecological resilience are identified, namely that social-ecological systems are linked, that linked social-ecological systems are complex adap­tive systems, and that building adaptive capacity for resilience is the key objective in governing linked social-ecological systems. These assumptions are placed in their broader context, of human–nature relations, the dynamics of change, and governance respectively, which are the structuring themes for the paper. I ask three questions with respect to each of these themes: How does social-ecological resilience conceptualize this? How does planning theory conceptualize this? What resulting issues for planning theory are raised? The purpose of doing this was twofold. First, to make explicit the ontological and epistemological assumptions embedded in social-ecological resilience. Second, to determine what issues social-ecological resilience raises for planning theory. The specific focus is on insights for planning theory per se and wherever possible the paper avoids making inferences for general planning scholarship.

Of course, both the domain of social-ecological resilience and the domain of planning theory are extensive and rapidly evolving, which is not unproblematic. A key challenge in engaging the resilience literature is that the concept of resilience has been extended to the degree that ‘both conceptual clarity and practical relevance are critically in danger’ (Brand and Jax, 2007: 22). This research is interested in social-ecological resilience. Social-ecological resilience is the ‘capacity of a system to absorb disturbance and reor­ganize while undergoing change so as to still retain essentially the same function, struc­ture and feedbacks, and therefore identity, that is, the capacity to change in order to maintain the same identity’ (Folke et al., 2010). The focus on social-ecological resilience is distinct from engineering resilience, social resilience or even ecological/ecosystem resilience (Adger, 2000; Folke, 2006: 259). The choice to focus on social-ecological resilience is deliberate as it is considered the most fruitful way to explore key gaps raised by planning theory scholars, in particular the need to pay more attention to matters of substance, and the specific call to address the implications of dynamic ecology in urban systems. This is not to say that other schools of resilience, including social resilience, community resilience and communicative resilience, are not of relevance for planning theory. Nor is it to deny the obvious relationships between them.

### Alt Fails

#### Complexity cannot be integrated into transportation planning—impacts will happen by the time we analyze the situation sufficiently.

Ruth and Coelho 2006

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“Managing the Interrelations Among Urban Infrastructure, Population, and Institutions” Forschungszentrum Nachhaltigkeit (artec-paper Nr. 136)] Ruth Coelho 10

In this paper we reflected on the drivers of urban change, and various approaches to understand and manage that change. While the research areas in urban theory and analysis are broad, we have deliberately focused on recent developments that were spawned by, or are otherwise closely related to, insights from complexity theory, and that are part of the ongoing discussion about the impacts of global (environmental) change on quality of life in cities. We have argued that continued urbanization, more extensive globalization, and increasing impacts of global environmental change pose complex challenges to urban planners and managers and require that the scientific community develops and uses concepts and methods that advance the understanding of that complexity. This is particularly important if the science is used to inform policy and investment decision making.

Yet, as urban analysis begins to integrate insights about the complex behavior of urban systems and uses frameworks for analysis, either explicitly or implicitly, that are informed by complexity theory, several challenges emerge. First, there is the problem of mismatched world views: decision makers are asking for projections on which to base their decisions; integrated assessments provide diverse scenarios of potential future system trajectories. Rather than basing decisions on projections, the challenge will be to identify strategies that are robust for a wide range of possible scenarios. Second, and closely related to the first of these challenges: for one group, models and reports are an end product that (linearly) enters into a decision making process. For the other, integrated assessment is part of an iterative process of adaptive and anticipatory management. Given limited budgets and planning horizons, adaptive and anticipatory management are difficult to implement in many institutional settings.

Efforts to overcome these challenges are themselves rife with problems. Embracing broad stakeholder communities in the scientific process can bias the science through undue influence of special interests. It can also reduce the value that science adds to the decision making process if it has to meet some lower common denominator during the consensus building process, for example if only a narrow set of scenarios are presented to scope investment and policy choices, or if the creation of scenarios itself is strongly biased towards pre-existing notions of what the future *will* look like.

### Micro-frames solve

#### The affirmative’s focus on smaller frames of transportation planning deconstructs reductionist policymaking—alternative policy solutions reveal themselves!

#### Lowe, 2011

[Kate Lowe. PhD at Cornell University. Neighborhood, City, or Region: Deconstructing Scale in Planning Frames. Berkeley Planning Journal 24(1). 2011]

Frames, constructed through ongoing processes, help us understand¶ the world, identify problems, and create solutions. The field of planning¶ has not generated a cumulative body of work on the role of our spatial¶ concepts in framing, although some geographic and environmental¶ studies literature has treated scale as one aspect of frames in political¶ processes. Based on the framing literature, I argue that planning must¶ deconstruct scale in order to reflect on how this component of our frames¶ 58 Berkeley Planning Journal, Volume 24, 2011¶ influences our visions and analysis. I use the example of planning in the¶ San Francisco Bay Area to demonstrate how integral scales can be in¶ frames and resulting solutions.¶ Government-led neighborhood planning was an important response¶ to the social upheaval of the 1960s, including the mobilization against¶ urban renewal. It may continue to be a useful and critical scale at¶ which to address equity issues. It can also be an effective arena for¶ mobilizing low-income and minority residents, since the neighborhood¶ is a meaningful scale of experience (Rohe, 2009). Nonetheless, the¶ neighborhood is only one scale at which to act or to frame issues.¶ Purcell (2006) warns against the “local trap, in which the local scale¶ is assumed to be inherently more democratic than other scales” (p.¶ 1921). He explains that any scale is socially constructed and outcomes¶ are dependent “on the agenda of those empowered by a given scalar¶ strategy. The paper does not reject the local scale, therefore; it argues¶ that we should reject the local trap” (p. 1922, emphasis original). Pastor,¶ Benner and Matsuoka (2009) describe the potential of and current¶ efforts towards regional equity.¶ Scaled frames could have material implications, as in the two-track¶ investment program in the San Francisco Bay Area. Transit interventions¶ to improve accessibility at one scale can increase or decrease accessibility¶ at other scales (Occelli 2000). Occelli explains: “For example, improving¶ regional accessibility in an international context will not necessarily¶ have positive effects on all local areas. Conversely, higher accessibility¶ levels in a local area do not necessarily guarantee the improvement of¶ its connections with regional or international markets” (p. 295). This¶ insight—that improving travel at one scale may have effects at other¶ scales—may have implications for the federal high-speed rail program.¶ Like the Interstate program, high-speed rail may have metropolitan¶ and neighborhood mobility effects, despite its focus on longer-distance¶ travel. Given the extent of the federal and local investment, planning¶ should deconstruct the scaled frames in the program. High-speed rail¶ is sometimes promoted to enhance mega-region connectivity, but what¶ is the problem addressed by this solution? Will the program facilitate¶ accessibility? Or simply mobility? For whom and at what scale?¶ Analyzing problems at different scales will continue in planning, but¶ planners and planning institutions can shift scale to identify alternative¶ solutions. As Most, Sengupta and Burgener (2004) note, environmental¶ justice analyses at different scales can yield different findings. Even¶ individual planners can simply try different scales of analysis to look for¶ different results, since powerful geospatial software and digitized data¶ are increasingly accessible. Institutional requirements for multiple scales¶ of analysis could be useful. For example, environmental review processes¶ Neighborhood, City, or Region 59¶ could require multiple scales of analysis. While incremental, these are¶ feasible steps to expand ways of seeing in planning.¶ A more challenging transformation would be to make scale justification¶ part of the planning process, perhaps through changing norms of¶ planning. Rather than automatically crafting a city plan—or whatever¶ the corresponding scale of the agency—planning departments and¶ agencies could conduct analysis on why the city or another scale might¶ be a useful for intervention. Plans could justify their scalar focus and¶ identify problems and potential action at other scales. Shifting scales¶ and frames may help us see new solutions and our existing assumptions¶ more clearly. What would accessibility solutions look like when treated¶ as a regional problem? What would mobility for economic growth and¶ decreased congestion look like if planned at a different scale?

### Perm Solvency

#### Permutation is key to solve social inequity—complex processes must be viewed in a smaller frame.

#### Lowe, 2011

[Kate Lowe. PhD at Cornell University. Neighborhood, City, or Region: Deconstructing Scale in Planning Frames. Berkeley Planning Journal 24(1). 2011]

Another scaled frame in the plan addresses accessibility for low-income¶ and minority residents at the neighborhood scale. The “problem” in this¶ frame is the need of these residents to reach opportunities like jobs, healthcare, and education—in other words, providing adequate accessibility.¶ An individual’s accessibility is her ability to reach opportunity sites. It is¶ related to mobility (the ability to move through space), but also depends on¶ her location and the spatial distribution of opportunities. The relationship¶ between mobility and accessibility might explain the similar frequency at¶ which these two words appeared with the word neighborhood, as shown¶ in Table 2. MTC explains that “another and equally pressing concern is¶ the ability to provide a cohesive, reliable system of transit for those who¶ depend on it most—individuals who because of economics, physical¶ disability or age cannot (or choose not) to drive. Many of these service¶ needs are oriented to the neighborhood and community level” (MTC 2001,¶ p. 5, emphasis added). The 2030 plan explains the need for sufficient¶ access, “whether the destination is work, school or the doctor, all Bay Area¶ residents—regardless of income, age or disability status—must be able to¶ get from place to place” (MTC, 2005, p. 52).¶ This scaled frame identifies several solutions and actions. MTC had¶ launched a community-based transportation planning program for¶ low-income and minority communities. Each process resulted in “a¶ community-based transportation plan that includes prioritized, locally identified¶ transportation needs, as well as solutions to address them”¶ (MTC 2005, p. 14, emphasis added). The agency also identified a network¶ of critical “Lifeline” bus routes to which it has directed funds. For these¶ and some related programs, MTC allocated $216 million in its 2030 plan¶ and soon thereafter increased funds to $300 million (MTC 2009b).¶ In addition, MTC estimated accessibility for low-income and minority¶ populations at the neighborhood scale in 2030, using different scenarios.¶ MTC aggregated traffic analysis zones with high shares of low-income¶ and minority residents, labeled them “communities of concern,” and¶ measured access to essential destinations from these communities/¶ neighborhoods (MTC, 2004, p. 1-1). 2 The study found improved¶ accessibility with implementation of the projects in the 2030 plan, and¶ that the communities of concern would have accessibility generally equal¶ to or better than the rest of the region.3 These findings may partially be¶ due to the central location of many of the communities of concern, where¶ opportunity sites are close and densely distributed.

### Alt Fails

#### No mindset shift- Training planners fails- They will always twist knowledge to support their preconceived notions of planning-

Zellner et al 12,

Moira Zellner et al, assistant professor in the Department of Urban Planning and Policy and a research assistant professor in the Institute for Environmental Science and Policy at the University of Illinois at Chicago,

Modeling, learning, and planning together: an application of participatory agent-based modeling to environmental planning, URISA Journal Jan, 2012  Volume 24,  Issue1, 1/01/2012

When stakeholders discussed how policies and behavior might affect the groundwater levels in the county, they did not describe antagonistic positions or conflicts between individual and collective goals. As they explored implementation alternatives with the models, most stakeholders recognized that individual water users would need to change their behavior and consume less water (self-interest) to preserve the resource for the region (collective interest). However, when asked if they, as residents of the county, would pay for water, some of the respondents resisted: "I don't know. You would have to convince me that the worth of water is such that I should have to pay ..." "I'm actually not sure I even want to answer this. We have our own well. I'd have to have a real understanding of the reasoning behind a fee like that. Scary ..."  
These stakeholders understood the collective need of the county and how individual behavior needed to change, but they did not want to share in this responsibility. The first reason is that the agents in the models were abstracted from the practical moral relationships each stakeholder inhabits. The cognitive awareness of these effects did not engage the emotional attachments that each stakeholder possesses for his or her personal way of life. Simulating change for everyone works differently than imagining change for oneself. Second, reliance on rational planning to prepare the WRAP focused on technical solutions that ignored social and environmental interdependence, limiting the understanding of complexity as well as the recognition of meaningful moral responsibility.  
Additionally, stakeholders actively distorted the practical meaning of the simulation results and thus reinforced the existing viewpoint rather than transformed it. For instance, instead of using the simulation results--which had been collectively validated--to reconsider their commitment to continued growth and expansion, two stakeholders shifted temporal scales to argue that had WRAP measures been applied decades earlier, current depletion risk would be much less. Therefore, the WRAP components needed to be adopted quickly so that growth could occur: "[Growth] is going to happen anyway ..." "We can absolutely continue to grow ... but we have to do something now." Instead of using knowledge to amend the plans for the future that would require a change in moral responsibility, they twisted the knowledge to fit a fantasy reconstruction of the past to support the measures included in the county plan.

### Alt FAils

#### No mindset shift- Moral and emotional commitments inspire resistance- planners too rooted in traditional planning

Zellner et al 12,

Moira Zellner et al, assistant professor in the Department of Urban Planning and Policy and a research assistant professor in the Institute for Environmental Science and Policy at the University of Illinois at Chicago,

Modeling, learning, and planning together: an application of participatory agent-based modeling to environmental planning, URISA Journal Jan, 2012  Volume 24,  Issue1, 1/01/2012

#### Second, the use of models to estimate complex interaction effects did not readily result in a transfer of these insights to planning practice, at least not in the short time frame of this experience. While stakeholders showed evidence that they were able to use modeling to explore and recognize complex interaction effects, they were not willing or in some cases were unable to interpret these effects in a cognitively coherent or morally relevant fashion. The emotional and moral commitments people make inspire resistance even in the face of self-generated simulation evidence. When repeated tests of favorite policies did not remedy depletion, stakeholders neither challenged the model nor revised prior plan assumptions about local development prospects. They instead composed arguments and narratives to sidestep the discrepancy. More time exploring these arguments might have led to a broader cognitive and moral awakening to the interdependence that accompanies reliance on a common good such as an aquifer and how plans for coordination to ensure sustainability require important shifts in responsibility. Although we offered to continue with an additional set of participatory modeling meetings, and stakeholders acknowledged what they had learned through the participatory modeling proposed here, they still preferred the traditional use of models in planning: having experts produce and present outputs (answers) in public meetings with other policy makers. We believe this also may be because of a culture of passive consumption of modeling outputs, where answers are provided by the experts to feed into a political process, instead of a practice of cogeneration of knowledge, values, and plans among different sectors of expertise (Zellner 2008), precisely because with most kinds of models, it is difficult for nonexperts to engage in modeling activities. Learning new ways to conceive and represent familiar problems and solutions proved more difficult to inspire than our design had allowed. Overcoming the barriers we encountered will not be straightforward. It is likely that the demand for expert facilitation will remain, even when we make improvements to the software to reduce some of the user discomfort and increase user access to the rules in the model, and adjust the social process to allow for more exploration and reflection. Nevertheless, the signs of active inquiry learning witnessed even in this limited study argues that agent-based modeling can and should be more actively incorporated as a critical component of plan making and policy making around complex environmental problems, particularly as it helps communities integrate different forms of knowledge, perspectives, and expertise into a guiding collective vision for a sustainable future.