## 1NC

#### Text

#### The United States Federal Government should apply a climate environmental impact assessment requirement to the mandates of the plan. Any necessary modifications will be made prior to implementation.

#### Observation One: The Counterplan is legitimate-It test increase investment which is the core issue in the resolution. Literature makes the counterplan predictable. Net benefits check abuse and provide a germane policymaking warrant to vote negative.

#### Observation Two: Net Benefits

Applying climate risk assessment to future transportation infrastructure investment decisions is critical to developing sound policy that promotes climate adaptation

NTPP ‘9 (National Transportation Policy Project, Bipartisan coalition of transportation policy experts, business and civic leaders, and is chaired by four distinguished former elected officials who served at the federal, state, and local levels, Published December 15 2009, Bipartisan Policy Center, <http://bipartisanpolicy.org/sites/default/files/Transportation%20Adaptation%20(3).pdf>)

The previous sections highlight the need for adaptation planning at the national, state, and local ¶ levels to address the potential impacts of climate ¶ change on the nation’s transportation infrastructure. A wide range of policy options have ¶ been presented in the literature regarding adaptation approaches to deal with the impacts of ¶ climate change, as shown in Table 2.1 (see page ¶ 28). For our purposes, these policy options can be ¶ thought of as addressing one of ﬁve different areas:B Research. A summary of the policy options ¶ underscores the need for further research to ¶ develop successful approaches to adaptation. ¶ Research needs span both the climate science ¶ and transportation arenas and include: applied ¶ studies — such as the development of methods ¶ for transportation practitioners to inventory ¶ transportation assets, the development of a ¶ climate data clearinghouse for use by transportation agencies, and more advanced climate ¶ research to develop more accurate “downscaled” ¶ regional models that can provide outputs for ¶ the diverse range of geographies across the nation. Another critical research need cited is for ¶ improved monitoring technologies to provide ¶ transportation ofﬁcials with advance warning ¶ of potential structural failures due to climate ¶ change impacts.¶ B Planning. Climate risks and adaptation options ¶ need to be integrated into the transportation ¶ planning process. Because of the important role ¶ of state and local governments in the operations ¶ and maintenance of the transportation system ¶ in the nation, there is an increased need to ¶ encourage cross-disciplinary coordination and ¶ collaboration among the various government ¶ agencies, as well as with the private sector (for ¶ example, the private sector railroad operators ¶ who own and maintain the majority of the ¶ nation’s rail network). Another key policy option is the expansion of planning timeframes ¶ that agencies would need for incorporating the ¶ impacts of climate change into their long-range ¶ vision plans. The timeframes generally used ¶ for the federal transportation planning process — 20 to 30 years — are short compared ¶ to the multi-decadal period over which climate ¶ changes occur. While the current timeframe is ¶ realistic for investment planning, agencies need ¶ to consider incorporating longer-term climate ¶ change effects into their visioning and scenario ¶ planning processes that inform their long-range ¶ plans. The literature also identiﬁed a need for ¶ decision support tools to support the planning ¶ process, such as risk assessment tools and adaptive management approaches. ¶ B Design standards. Development of new design ¶ standards also is identiﬁed as a need to incorporate the impacts of climate change into design ¶ and operations. This includes both infrastructure design standards as well as revision of ¶ ﬂood frequency standards to reﬂect climate ¶ projections rather than only historic trend data ¶ (e.g., the 100-year ﬂood may now be a 25-year ¶ ﬂood). Along with new design standards there ¶ is a need to develop ways to share best practices ¶ for adaptation design strategies which state and ¶ local governments can easily access.¶ B Project delivery and the NEPA process. The ¶ fourth category of policy options is the project ¶ delivery and the NEPA process. For example, ¶ by updating federal agency regulations and ¶ procedures pertaining to climate impacts and ¶ adaptation strategies, state, and local agencies can better ensure efﬁciency in adaptation ¶ planning and implementation. A collaborative and ﬂexible approach to the federal permitting ¶ process can allow state and local agencies to ¶ align their efforts.¶ B Funding, performance, and accountability. ¶ The ﬁnal category of policy options revolves ¶ around funding, performance, and accountability. These policy options range from assessing ¶ the long-term costs and beneﬁts of adaptation ¶ measures to developing performance measures ¶ to determining how to prioritize and fund adaptation projects. The funding mechanisms at ¶ the federal and state level can provide incentives ¶ for addressing climate change impacts through ¶ proactive adaptation planning.

#### Climate change will destroy all factions of our infrastructure – adapting it is the only way to solve. Turns the Case

Hyman et al ’11 (Rob Hyman and Rebecca Lupes of the Federal Highway Adminstration, David Perlman of the Volpe National Transportation Systems Center, Transportation Research Board, June 2011, http://12.0.47.91/pubs/ec152.pdf#page=18)

The projected effects of climate change could have significant implications for the nation’s¶ transportation system. Rising sea levels, increasingly extreme temperatures, changes in the¶ frequency and intensity of storm events, and accelerating patterns of erosion could damage¶ infrastructure, flood roadways, and disrupt safe and efficient travel. Certain effects, such as sea¶ level rise and increases in storm intensity, present obvious challenges. Storm surge can damage¶ and destroy coastal roadways, rail lines, and bridges and sea level rise will only exacerbate such¶ effects. Rising sea levels can also present flooding risks to underground infrastructure such as¶ subways and road tunnels, allowing water to enter through portals and ventilation shafts. Subtle¶ changes, such as those expected in temperature, will also necessitate changes in the design,¶ construction, and maintenance of infrastructure—for instance, the incorporation of materials and¶ building techniques that can withstand temperature extremes. Some climate change effects may¶ positively impact transportation, as higher average temperatures in certain regions could reduce¶ safety and maintenance concerns associated with snow and ice accumulation. Although¶ mitigating the effects of climate change through reductions in greenhouse gases is an important¶ element of the Federal Highway Administration’s (FHWA’s) climate change strategy, the agency¶ places equal importance on acknowledging that certain changes may require appropriate¶ adaptation strategies.

#### Failure to adapt our transportation infrastructure threatens human survival

Institution of Mechanical Engineers 9

<http://www.imeche.org/knowledge/themes/environment/climate-change/adaptation/adaptation-report>

Climate Change: Adapting to the Inevitable?

The Institution of Mechanical Engineers’ latest environment theme report is Climate Change: Adapting to the Inevitable? It considers the possible climate changes which we may expect over the next 1,000 years due to continuing CO2 emissions, and recommends what engineers need to do to adapt to our future world so that we can cope with these changes. Man’s activities are causing the world’s climate to change rapidly. Although many nations will be able to cope with the impacts of climate change in the short term, albeit at a cost, long term, it will be a very different story. Global governments will be meeting in November 2009 to agree a successor to the Kyoto Protocol, proposing reducing global carbon dioxide emissions by mitigation. However, as global emissions are not reducing and the climate is changing, the more pragmatic approach, as suggested by the Institution, is that only by adapting our behaviour can we hope to secure long-term human survival. We have to look at how engineers might help our world to adapt to changes over the next few centuries. The effects of temperature increase – the heart of climate change – will be felt globally. For developed countries, such as the UK, flooding and rising sea levels will be a massive problem – a 7m rise in sea levels would mean the abandonment of most parts of London which border the Thames ie Canary Wharf, Chelsea and Westminster. For developing countries such as Botswana there would be extreme social and economic issues. Four areas of engineering are considered under the above climate scenarios: energy, water, buildings, and transport, and how they will need to be adapted to deliver a more resilient and robust adaptive management system. What needs to happen? The Institution of Mechanical Engineers therefore recommends the following: Rising sea levels and increased flooding will require serious consideration of the viability of settlements, transport routes and infrastructure To protect the welfare of its citizens governments must support climate adaptation More research, development and investment in renewable energy sources is required to offset the loss of fossil fuels We have to invest in Carbon Capture and Storage technology The industrialised world has to take the lead in taking responsibility for the economic needs of vulnerable nations

## Theory

### A2: CP Illegitimate

**---Condition Counterplans don’t undermine affirmative offense-**The counterplan test the unconditional increase of investment-The 2AC can generate offense around the lack of certainty, delay, and other reasons the particular condition is problematic.

**---Optimal Policy**-The purpose of policy debate is to find the best policy. The affirmative has unlimited time to devise the best plan it can. If it’s proven not to be the best, it should be rejected.

**---Real World**-Actual policy debate often centers around small differences between policies, not radically different alternatives. The art of political compromise is the art of finding common ground.

**---Literature**-Our counterplan is predictable and part of the actual policy discussion surrounding their plan. Their argument creates arbitrary exclusions which undermine competition and education.

**---Education**-Procedural debate can be a good thing. Narrower focus allows greater depth of discussion. Implementation questions are also more realistic than are debates over radically distinct alternatives.

**---Doesn’t waste the 1AC**-The affirmative still sets the the initial ground for the debate. The negative must still find some aspect of the affirmative plan with which to compete. The negative isn’t obligated to run arguments that were preempted in the 1AC. It’s more fair to let both teams partially determine ground for the debate.

**---Don’t trivialize the debate**-If the difference between the plan and the counterplan is large enough to generate a net benefit, than it’s worth debating. This argument isn’t unique as many affirmatives’s are only a small departure from the status quo.

**---Punishment doesn’t fit the crime**-The judge should evaluate theory like extra-topicality. The counterplan should be judged outside their jurisdiction and a lost option for the negative to advocate.

### A2: Conditionality

**---Real World**-Policy makers do consider multiple options at once. Their argument guts one of the core elements of policy discussion.

**---Best policy justifies**-Multiple options make it more likeley that the best policy will be found. The role of the judge is to endorse the best policy at the end of the round. If a conditional counterplan has been proven to be the best policy, it’s perverse not to allow it to be endorsed.

**---Education**-Argument breadth has benefits. If depth were the only value, teams wouldn’t be allowed to debate more than one advantage or disadvantage per round. Exploring the range of issues on a subject is also intellectually important.

**---Time limits aren’t an answer**

A. Time is finite in debate. Running one argument inherently trades off with another.

B. Other arguments make this non-unique. Multiple topicality arguments, two card disads, or kritiks equally distort time.

C. Creating time pressure and making time based decisions is an inherent part of debate strategy. It’s an acceptable part of all other debate arguments.

**---Permutations justify**-Retaining the status quo as an option is reciprocal to the affirmative’s ability to advocate the plan or permutation.

**---Conditionality is reciprocal to the affirmative’s ability to select a case**. Since the affirmative selects the ground for the debate they enjoy a huge preparation advantage. Allowing hypothetical negative arguments helps to defeat this edge.

**---Advocacy concerns aren’t decisive**.

A. In the real world, policies are attacked from avariety of perspectives. In debate there is only one negative team, so to encompass the true range of potential counter-affirmative advocacy, multiple positions must be allowed.

B. Most debate practice isn’t consistent with the advocacy paradigm. Strategic concessions by the affirmative and permutations allow the affirmative to advocate multiple positions.

**---Not a voting issue**. Emphasis on punishment incentivizes a race to bottom discouraging substantive debates.

### A2: Do Both

#### **---The permutation severs out of the unconditional nature of plan adoption by opening up the mandates of the plan to modifications. Severance is illegitimate and a voting issue because it destroys negative ground. No counterplan could compete if the affirmative can pick and choose which parts to defend in the 2AC.**

#### ---Should implies mandatory

A Dictionary of Modern Legal Usage, Bryan A Garner, scholar of the English Language, March 2001

Should. Oddly, should, like may, q.v., is sometimes used to create mandatory standards, as in the ABA Code of Judicial Conduct. In that code, in which “[t]he canons...establish mandatory standards unless otherwise indicated,” six of the seven canons begin, “A Judge should...” See ought (b) & shall.

#### The counterplan is plan minus because there are fewer instances under which investment would increase.

#### ---It is a time-frame permutation because it conducts a risk assessment prior to adoption of the plan. Immediacy preserves core negative ground like politics and economy disadvantages that rely on time sensitive research.

#### ---Permutation undermines the effectiveness of the assessment---Assessment prior to implementation protects the process.

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**ARTICLE: Environmental Law and International Assistance: The Challenge of Strengthening Environmental Law in the Developing World**

3. Timing

According to the IUCN Draft Covenant, the evaluation of significant activities must take place before any approvals are issued. 135 That, of 8540\*46 course, is logical for otherwise the assessment process might become a mere post-hoc rationalization for previously made decisions. It would be wise, in fact, to start the EIA process as soon as a governmental office begins to formulate or is presented with a proposal so that the process as well as the environmental document can actually shape as well as inform the eventual decision. 136

#### ---Public Participation

#### A. Public participation must be allowed to shape the process for effective assessment-The permutation fiats past public involvement.

Ernsdorff 92 67 Wash. L. Rev. 133, \*

COMMENT: THE AGENCY FOR INTERNATIONAL DEVELOPMENT AND NEPA: A DUTY UNFULFILLED.

The NEPA regulations stress public participation. 45 They proclaim that public scrutiny is essential to NEPA's implementation 46 and require federal agencies to encourage and facilitate public involvement to the fullest extent possible. 47 This public participation requirement is reiterated throughout the Council on Environmental Quality (CEQ) 48 guidelines in a general statement 49 as well as in specific areas such as scoping 50 and EIS preparation. 51 Additionally, the regulations require that agencies respect public comments and consider them in their decision-making process. 52 The success of the NEPA procedures is undisputed. 53 Its goal of environmentally conscious decision-making has, at least domestically, [\*140] been fulfilled. Countless projects have been modified or discontinued as a result of information collected under NEPA procedures. Additionally, NEPA's success has lead many states and foreign nations to adopt similar environmental evaluation procedures. 54

B. Public participation key to effective assessment

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An easy and relatively inexpensive way to try to ensure a higher degree of objectivity during the EIA process is to give the public an opportunity to comment on a draft version of the EIA that has been translated into the local language. 164 While written comments should certainly be sought and accepted, the submission of views in written form is simply not a practical option for illiterate or semi-literate individuals. Public meetings, therefore, must be held 165 so that the EIA can be summarized for the affected community in an oral and non-technical fashion, and comments can be taken and recorded. 166 Workshops can also be held in an effort to educate the public about the project. 167 Other agencies that have special expertise or jurisdiction should also participate in the EIA process in order to check the rather natural inclination of project proponents to elevate their more parochial goals above relevant environmental considerations. 168 These agencies, in fact, should be required to comment to ensure that they are actually watching. 169 Public participation is not just a useful exercise in democracy. It produces additional data and information 170 as well as a broad array of new 8540\*51 perspectives, which should make the final EIA more thorough and more rational. Open participation in the EIA process should also help to flush out serious analytical errors in the EIA as well as any possible bias. While it may be tempting to ignore a troublesome comment, it is virtually impossible to do so if the drafter is required not only to receive, but also to respond to all of the relevant comments in the course of the final EIA. 171 Not only does this make the drafter actually listen, but it also makes it more difficult for any interested person or group to have influence beyond the merits of their argument. The drafter will have to respond in some reasonable way to all of the serious arguments made by any person or any group, regardless of wealth or status. 172 Drafters should be required to respond to the views expressed by the comment agencies for precisely the same reasons. In this way, both the public as well as the environmental agencies can strive to keep science, reason, and the principles of sustainable development at the forefront of the EIA process. 173

## Solvency

### Adaptation Key

#### Investment in new design, construction, and maintenance of transportation infrastructure is critical to mitigating the effects of climate change

Transportation Research Board of the National Academies ’11 [Transportation Research Board, “ Adapting Transportation to the Impacts of Climate Change”, June 2011, Transportation Research Circular, E-C152, <http://www.trb.org/Publications/Blurbs/165529.aspx> AD]

T**he projected effects of climate change could have significant implications for the nation’s transportation system**. Rising sea levels**,** increasingly extreme temperatures**, changes in the frequency and intensity of** storm events, **and accelerating patterns of** erosion **could damage infrastructure, flood roadways, and disrupt safe and efficient travel**. Certain effects, such as sea level rise and increases in storm intensity, present obvious challenges. Storm surge can damage and destroy coastal roadways, rail lines, and bridges and sea level rise will only exacerbate such effects. Rising sea levels can also present flooding risks to underground infrastructure such as subways and road tunnels, allowing water to enter through portals and ventilation shafts. Subtle changes, such as those expected in temperature, will also necessitate changes in the design, construction, and maintenance of infrastructure—for instance, the incorporation of materials and building techniques that can withstand temperature extremes. Some climate change effects may positively impact transportation, as higher average temperatures in certain regions could reduce safety and maintenance concerns associated with snow and ice accumulation. Although mitigating the effects of climate change through reductions in greenhouse gases is an important element of the Federal Highway Administration’s (FHWA’s) climate change strategy, the agency places equal importance on acknowledging that certain changes may require appropriate adaptation strategies.

#### We must incorporate climate risk analysis into all infrastructure investment plans.

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Incorporate climate risk analysis into Federal ¶ Infrastructure Investment policies. Revise Federal ¶ Infrastructure Investment Executive Order(s) ¶ to explicitly incorporate climate-related risk ¶ analysis into infrastructure investment plans and ¶ decision-making. This could include developing ¶ inventories of transportation facilities vulnerable to climate change, and developing updated ¶ construction standards to address transportation ¶ and other infrastructure in vulnerable locations. cConduct a federal interagency assessment to develop and prioritize a climate adapta tion research, ¶ data, and policy agenda. This could be an important precursor to funding of a recommended ¶ interagency, interdisciplinary, long-term, ¶ national climate-adaptation research program in ¶ transportation and climate legislation this year.

#### Incorporating climate considerations into transportation legislation solves in the short term.

NTPP ‘9 (National Transportation Policy Project, Bipartisan coalition of transportation policy experts, business and civic leaders, and is chaired by four distinguished former elected officials who served at the federal, state, and local levels, Published December 15 2009, Bipartisan Policy Center, <http://bipartisanpolicy.org/sites/default/files/Transportation%20Adaptation%20(3).pdf>)

Near-term planning actions focus on the immediate¶ steps needed to integrate climate change¶ into the transportation planning process: revising¶ planning process requirements, establishing¶ long-term scenario planning that looks beyond¶ the current federally-mandated planning horizon,¶ beginning the process of inventorying transportation¶ facilities at risk from climate change, and¶ integrating climate impact considerations into¶ emergency planning.¶ 􀁂􀀀 Revise planning process requirements in the next¶ surface transportation authorization bill to address¶ climate considerations. Legislative action or guidance¶ should address the incorporation of climate¶ change considerations — both emissions mitigation¶ and adaptation — in the planning process.¶ This may be accomplished by adding climate¶ change as a distinct planning factor, requiring¶ and supporting cross-agency consultation among¶ climate science agencies, transportation agencies,¶ resource agencies and local governments; and/¶ or specifying that climate measures be included¶ as part of a performance-based planning and¶ program approach. Lead agency: DOT

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#### The US shouldn’t be unprepared for climate change like we were in 2010 and 2008. We need to act like the UK to save our infrastructure before it’s too late.

Transportation Research Board of the National Academies ’11 [Transportation Research Board, “ Adapting Transportation to the Impacts of Climate Change”, June 2011, Transportation Research Circular, E-C152, <http://www.trb.org/Publications/Blurbs/165529.aspx> AD]

The cross-sector/departmental approach that is being taken by the U.K. government further demonstrates the linkages and interdependencies between the various sectors, including transportation, energy, water, and communications with respect to climate adaptation. This approach will ensure that adaptation in the transportation sector is not addressed in isolation. A 2010 URS Corporation report has identified two key types of **interdependencies that are likely to have far greater impacts on infrastructure functionality** than individual failures. The first interdependency is cascade failures, which refers to a series of linked impacts or failures, and the second is regional convergences of infrastructure, which, if impacted by an extreme weather event, could have consequences on functionality at a national scale in one or more of the sectors. Ensuring that adaptation is embedded in key policies at the national level, the ACC Program requires each U.K. government department to produce Departmental Adaptation Plans (DAPs). The Department for Transport’s (DfT) DAP highlights what has been done to date to understand and manage climate change related risk and the actions that will be taken in the period between 2010 and 2012. **The** ultimate **aim of the plan is to ensure the delivery of the department’s strategic aim** (“transport that works for everyone”) **through a U.K. transportation system that continues to operate effectively because its infrastructure and operations have been planned, designed, and maintained to be resilient to future climate change**. While not part of the ACC Program or other adaptation initiatives, the U.K. government has also recently been responsible for producing the first U.K. National Infrastructure Plan. The plan outlines the scale of the challenges facing the U.K.’s infrastructure (including energy, transportation, digital communications, floodwater, and waste management) and the major investment required to underpin sustainable growth. **The plan also addresses issues relating to climate adaptation across the range of infrastructure-related sectors, and identifies the need for transportation infrastructure to adapt to climate change in order to provide security and resilience against the increased risk from natural hazards, such as floods and heat waves.**

### Assessments Key

#### Risk Assessment approach allows for flexibility and constantly updated solutions

Hodges, Tina, August 2011, Federal Transit Administration “Flooded Bus Barns and Buckled Rails: Public Transportation and Climate Change Adaptation” Tina Hodges, Program Analyst Office Budget and Policy Federal Transit Administration U.S. Department of Transportation <http://www.fta.dot.gov/documents/FTA_0001_-_Flooded_Bus_Barns_and_Buckled_Rails.pdf>

Risk assessment tools developed by governments and non-profits offer transit agencies guidance on how to prioritize climate risks by assessing the likelihood of occurrence and the magnitude of consequence. Key aspects include assessing criticality of transit assets to regional economy, accessibility and emergency evacuation, and identifying thresholds above which impacts are severe (e.g., inches of rain per hour before drainage systems are overwhelmed). Steps generally include 1) identify current and future climate hazards; 2) characterize the risk of climate change on agency infrastructure and operations; 3) link strategies to agency organizational structures and activities; 4) implement adaptation plans; and 5) monitor and reassess. Taking a risk management approach mitigates risk without expensively over-engineering assets. A flexible strategy takes action now but reassesses as new information becomes available—responding to multiple layers of uncertainty regarding future levels of greenhouse gas emissions, how climate hazards will impact transit, and the effectiveness of adaptation strategies [10].

#### Risk Assessment key to identify endangered structures

Joanne R. Potter et al, March 2008, Michael J. Savonis, Virginia R. Burkett U.S. Climate Change Science Program Synthesis and Assessment Product 4.7 “Impacts of Climate Change and Variability on Transportation Systems and Infrastructure: Gulf Coast Study, Phase I” <http://files.library.northwestern.edu.turing.library.northwestern.edu/transportation/online/restricted/200819/PB2008110533.pdf>

Ultimately, the purpose of a risk assessment approach is to enhance the resilience of the transportation network. Analysis of these factors can help transportation decision makers identify those facilities most at risk and adopt adaptation strategies to improve the resilience of facilities or systems. Structures can be hardened, raised, or even relocated as need be, and – where critical to safety and mobility – expanded redundant systems may be considered as well. What adaptation strategies are employed, and for which components of the system, will be determined considering the significance of specific parts of the network to the mobility and safety of those served, the effects on overall system performance, the cost of implementation, and public perceptions and priorities. Generally speaking, as the importance of maintaining uninterrupted performance increases, the appropriate level of investment in adaptation for high-risk facilities should increase as well. This study does not make recommendations about specific facilities or adaptation strategies, but rather seeks to contribute to the information available so that States and local communities can make more informed decisions.

### A2: Nepa Bad

Mitigation measures solve the case and avoid environmental risks

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**ARTICLE: Environmental Law and International Assistance: The Challenge of Strengthening Environmental Law in the Developing World**

Another key component of an EIA is an evaluation of appropriate mitigation measures. 146 According to the Draft IUCN Covenant, mitigation involves ways in which potential adverse effects can be either averted or minimized. 147 The U.S. CEQ regulations are more detailed, providing that mitigation can also involve, among other things: ways in which the affected environment can be repaired, restored, or rehabilitated; ways in which the impact can be reduced through preservation or maintenance operations during the life of the action; and compensation for the impact through the replacement or substitution of resources or environments. 148 In order to help inform the necessary decision-maker about the kind of measures that should be required as a condition of approval, the EIA ought to discuss mitigation in rather specific terms - namely, what measures can be taken to avoid, minimize, remediate, or compensate harm. 149

#### NEPA is effective—laundry list—prefer our ev its comparative

**Dreher 5**, (Robert G. Dreher, Executive Director of the Georgetown Environmental Law and Policy Institute. Served on the General Counsel of the U.S. Envronmental Protection Agency, “NEPA Under Siege”, http://www.law.georgetown.edu/gelpi/research\_archive/nepa/NEPAUnderSiegeFinal.pdf)

One criticism is that the NEPA review process, though well-intentioned, is largely a waste of time. Critics contend that the NEPA process is divorced from the actual process of agency decision-making, with agency deci- sions usually being made well in advance of the initia- tion of the NEPA process. As a result, they argue, the NEPA process does not actually inform agency decision making; instead, it is an after-the-fact paperwork exercise, adding useless delay and expense to government programs. Some critics also assert that the envi- ronmental analysis in NEPA documents is so poorly conducted or so riddled with uncertainties that it does not provide a reliable basis for agency decision-making.¶ The complaint that NEPA review is a useless paper exercise, often voiced by current or past agency¶ officials, partly reflects an understandable resentment by agency personnel toward a law whose explicit pur- pose is to alter the traditional course of agency deci- sion-making. Before they can begin to pursue a course of action, agency officials must formulate some goal for the agency. From an internal agency perspective, once a goal, even a tentative goal, has been estab- lished, compliance with the NEPA process, including consideration of alternatives, may seem like so much wasted effort. But this complaint overlooks the fact that one of the functions of NEPA is to force the¶ agency to consider whether, on second or third thought, it should choose an alternative or modified course of action. The true test of NEPA’s success is not whether agency officials welcome having their decisions publicly scrutinized, but whether the process produces better outcomes.¶ At the same time, this criticism does point up a commonly observed deficiency in NEPA implementa- tion. The NEPA regulations published by CEQ empha- size that the NEPA review should be conducted at the earliest possible point, and that NEPA reviews should be integrated with other existing programs and processes.37 Unfortunately, agencies do not consistently heed this guidance. While agency officials are unlikely to overcome entirely their sense that NEPA sometimes operates as an unnecessary impediment to the imple- mentation of decisions already made, early and¶ The true test of NEPA’s success is not whether agency officials welcome having their decisions publicly scrutinized, but whether the process produces better outcomes.¶ 11¶ effective integration of NEPA into the agency’s plan- ning would minimize agency frustrations and facilitate timely consideration of environmental values.¶ The complaint that NEPA analysis is technically or scientif ically def icient is more diff icult to assess. The breathtaking variety of federal agency actions subject to NEPA — from building or authorizing con- struction of highways, dams, pipelines and transmis- sion lines to managing the conflicting demands of recreational users, miners, grazers and timber compa- nies on the public lands — means that very different types of environmental analysis must be brought to bear on different types of federal actions. The chal- lenge in evaluating the effectiveness of NEPA is com- pounded by the lack of meaningful agency-specific, much less government-wide, programs to track the reliability of NEPA reviews. In addition, there are remarkably few independent studies of whether the NEPA process succeeds in predicting environmental outcomes.38 In debating whether NEPA reviews pro- duce reliable environmental predictions, the reality is that we are woefully under-informed.¶ Despite this uncertainty, it is clear that the analy- sis in NEPA documents assists agencies in making better, and more environmentally-sensitive, decisions. As one academic study concluded, EISs may not con- sistently produce precisely accurate environmental predictions, but they at least provide “sensible assessments” of likely environmental consequences to guide decision makers.39 The numerous NEPA success stories cited above demonstrate that federal agencies are better informed about the environmental consequences of their proposed actions than they would be in the absence of a forward-looking environmental analysis.¶ NEPA has transformed agency cultures, broadening agencies’ narrow mission-orientation to include sensi- tivity to environmental values. Moreover, as discussed above, the NEPA review process is not simply a techni- cal analysis of environmental impacts; it is also a politi- cal process for engaging the public in federal decision- making. NEPA has succeeded in creating a structured¶ framework for making public choices, based on the best available information, about what courses to pursue in an inherently uncertain world. As the Department of Energy’s highest environmental off icial recently affirmed, “NEPA is an essential platform for providing useful information to decisionmakers and the public, supporting good decisionmaking, and thus advancing DOE’s mission.”40¶ In any event, the appropriate response to uncer- tainties regarding the accuracy of the NEPA process is not to jettison environmental analysis, but to attempt to resolve the uncertainties and study how the NEPA process can be improved. Additional studies are needed on the accuracy of EISs, focusing on what methods of environmental analysis produce reliable results and what types of environmental consequences lend themselves to accurate prediction. As discussed below, Congress and the agencies should require agen- cies to engage in additional post-decision monitoring to improve the reliability of environmental reviews.¶ At the same time, advances in the science of environmental impact analysis already appear to be signif- icantly improving the environmental analysis in NEPA documents. Scientists are making steady progress in improving mapping using geographic information systems (“GIS”) techniques, in expanding computer modeling capabilities, and in developing our under- standing of ecological systems and biological func- tions. These new advances are being integrated into environmental analysis under NEPA on a continuous basis. Additional post-decision monitoring is needed to verify the benefits of these new techniques and to help refine them over time.

#### NEPA is effective at changing Federal Policy

Russell 12, (Irma S. Russell, Professor of Law at the University of Montana, “Streamlining NEPA to Combat Climate Change: Heresy or Necessity?”http://www.elawreview.org/elaw/394/streamlining\_nepa\_to\_combat\_gl.html, 2012)

The National Environmental Policy Act (NEPA)[4] requires federal agencies to consider the environmental impacts of major projects they undertake. It added to each agency's mission the additional requirement of considering the effects on the environment of federal projects.[5] To achieve its goal, NEPA mandates that "all agencies of the Federal Government . . . utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision making which may have an impact on man's environment."[6] NEPA's policy seeks to foster conditions "under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans."[7] NEPA has made significant changes in the way federal agencies go about achieving their missions.[8] Fulfilling the procedural requirements of NEPA takes time and money.[9]¶ NEPA results in delays in virtually all major energy projects. It applies to projects requiring federal permits because permitting requirements make energy projects federal agency actions under NEPA.[10] Thus, NEPA applies to traditional energy projects such as coal-fired utilities and, additionally, to energy projects aimed at supplying energy without the GHGs associated with combustion, such as concentrated solar installations, wind farms, and wave technology. The global climate crisis raises the question of whether the NEPA process is too slow. Should Congress streamline NEPA to bring clean power online faster? The argument for streamlining NEPA is that the intensity of global climate change makes rapid transition to clean energy a necessity. This argument suggests that a categorical approach to siting and licensing of clean energy resources may be a necessary step in the move toward greening the grid. Any reduction or shortening of the NEPA process is likely to be regarded as heresy by some. The benefits of shortening the timeframe or process for input in any major federal project must be scrutinized.

#### NEPA is effective at changing federal policy—especially environmental Policies

Dreher 5, (Robert G. Dreher, Executive Director of the Georgetown Environmental Law and Policy Institute. Served on the General Counsel of the U.S. Envronmental Protection Agency, “NEPA Under Siege”, http://www.law.georgetown.edu/gelpi/research\_archive/nepa/NEPAUnderSiegeFinal.pdf)

The National Environ- mental Policy Act (NEPA) has been extraordinarily successful in accomplishing its goals.¶ First, NEPA has unquestionably improved the quality of federal agency decision-making in terms of its sensitivity to environmental concerns. Examples are legion in which proposed federal actions that would have had serious environmental consequences were dramatically improved, or even in some instances abandoned, as a result of the NEPA process. To cite just a few instances:¶ ■ In the early 1990s, mounting problems with obso- lete nuclear reactors at its Savannah River site put the Department of Energy under pressure to build enormously expensive new reactors to produce tri- tium, a key constituent of nuclear warheads. A pro- grammatic EIS allowed DOE to evaluate alternative technologies, including using a particle accelerator or existing commercial reactors, leading ultimately to cancellation of the tritium production reactors. Admiral James Watkins, then Secretary of Energy, testified before the House Armed Services Commit- tee: “Looking back on it, thank God for NEPA because there were so many pressures to make a selection for a technology that it might have been forced upon us and that would have been wrong for the country.”16¶ ■ The NEPA process led to improvements in a land management plan for the Los Alamos National Lab- oratory that averted a potentially serious release of radiation when the sensitive nuclear laboratory was swept by wildfire in May 2000. The laboratory’s ini- tial management plan did not address the risk of wildfire, but other federal agencies alerted the Los Alamos staff to that risk in comments on the draft¶ NEPA reflects the belief that citizens have a right to know, and to be heard, when their government proposes actions that may affect them.¶ 4¶ EIS accompanying the plan. The laboratory pre- pared a fire contingency plan, cut back trees and underbrush around its buildings, and replaced wooden pallets holding drums of radioactive waste with aluminum. Those preparations turned out to be invaluable when a major wildfire swept Los Alamos the following year, damaging many buildings but not triggering a significant release of radiation.17¶ ■ In 1997, the Federal Energy Regulatory Commis- sion was considering issuance of a license for con- struction of a major new hydropower dam on the Penobscot River in Maine. The EIS disclosed that the proposed Basin Mills Dam would undermine long-standing federal, state and tribal efforts to restore wild Atlantic salmon populations to the Penobscot River. FERC received strong comments in opposition to the project from federal and state fishery managers and the Penobscot Indian Nation, among others, and concluded that the public interest was best served by denial of the license.¶ ■ The Ivory-billed woodpecker, recently rediscovered, to great public celebration, in the swamplands of Arkansas, owes its survival in large part to NEPA. In 1971, shortly after NEPA’s enactment, the Army Corps of Engineers advanced a proposal to dredge and channelize the Cache River for flood control, threatening the vast tracts of bottomland hardwood wetlands in the river basin on which the woodpecker and many other species of wildlife depended. Envi- ronmentalists challenged the adequacy of the Corps’ NEPA analysis in court, pointing out that the Corps had failed to evaluate alternatives to its massive¶ dredging program that would cause less damage to wetland habitat. The court enjoined the Corps from proceeding until it fully considered alternatives,18 and public outcry subsequently led to the abandon- ment of the dredging project and the creation of the national wildlife refuge where the Ivory-billed woodpecker was recently sighted.¶ ■ A massive timber sale proposed for the Gifford Pin- chot National Forest in Oregon, stalled by contro- versy over impacts on sensitive forest habitat, was entirely rethought as a result of the NEPA process. A coalition of environmentalists, the timber industry, labor representatives and local citizens worked together to develop a plan to use timber harvesting to restore the forest’s natural ecosystem. Instead of clearcuts, the new proposal focuses on thinning dense stands of Douglas fir (the result of previous clearcutting) to recreate a more natural, diverse for- est structure, while still yielding 5.2 million board feet of commercial timber. The citizen alternative was adopted by the Forest Service and implemented without appeals or litigation. A local resident involved in the process says: “It’s a win, win, win.” 19¶ ■ In Michigan, communities concerned about the impacts of a proposed new four-lane freeway suc- cessfully used the NEPA process to force the state highway agency to consider alternatives for expand-¶ The Ivory-billed woodpecker, recently rediscovered, to great public celebration, in the swamplands of Arkansas, owes its survival in large part to NEPA.¶ 5¶ ing and improving an existing highway, avoiding the largest wetland loss in Michigan’s history and sav- ing taxpayers $1.5 billion. Similarly, a proposed freeway in Kentucky’s scenic bluegrass region was redesigned to protect historic, aesthetic and natural values thanks to public input and legal action during the NEPA planning process. The National Trust for Historic Preservation acclaimed the Paris Pike as a project that “celebrates the spirit of place instead of obliterating it.” 20¶ These and other similar examples only begin to tell the story of NEPA’s success, however. NEPA’s most significant effect has been to deter federal agencies from bringing forward proposed projects that could not withstand public examination and debate. Prior to NEPA, federal agencies could embark on massive dam- or road-building projects, for example, without public consultation and with virtually no advance notice. As a result, family farms, valuable habitat, and sometimes whole communities were destroyed without the opportunity for full and fair debate. Today, many similar projects that could not survive such a debate simply never get off the drawing boards.¶ More broadly, NEPA has had pervasive effects on the conduct and thinking of federal administrative agencies. Congress’s directive that federal agencies use an “interdisciplinary approach” in decision-making affecting the environment,21 together with the Act’s requirement that agencies conduct detailed environ- mental analyses of major actions, has required federal agencies to add biologists, geologists, landscape archi- tects, archeologists, and environmental planners to¶ their staffs. These new employees brought new per- spectives and sensitivities to agencies that formerly had relatively narrow, mission-oriented cultures. NEPA’s requirement that agencies consult with federal and state agencies with special environmental expert- ise also has helped broaden agency awareness of envi- ronmental values.¶ Equally important, NEPA has succeeded in expand- ing public engagement in government decision-making, improving the quality of agency decisions and fulfilling principles of democratic governance that are central to our society. Today, citizens take it as a given that major governmental actions that could affect their lives and their communities will be subject to searching public examination and discussion. As CEQ concluded in a report commemorating NEPA’s 25th anniversary, “NEPA’s most enduring legacy is as a framework for collaboration between federal agencies and those who will bear the environmental, social, and economic impacts of their decisions.” 22 CEQ noted that “agencies today are more likely to consider the views of those who live and work in the surrounding community and others during the decision-making process.” As a result, “Federal agencies today are better informed about and more responsible for the consequences of their actions than they were before NEPA was passed.” 23

#### NEPA is effective at changing Federal Policy

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The extent and diversity of public participation in government decision-making as a result of NEPA is astonishing. To cite a few typical examples:¶ ■ The National Park Service proposed a lake manage- ment plan in 2002 for Lake Mead National Recre- ation Area in Nevada that raised significant issues regarding future recreational use of the lake, includ-¶ 6¶ ing what kinds of motorized boats should be allowed and whether the lake should be managed more like an urban park or more for primitive recre- ation. The Park Service received more than 10,000 comment letters on the draft EIS accompanying the plan. Commenters included 30 businesses, such as local marinas and jet ski manufacturers; 813 organi- zations, including national environmental groups, local community and boat-owning groups, the local chamber of commerce, the personal watercraft industry association, and many fishing groups; 17 public agencies, including neighboring national parks, state fish and game departments, nearby counties and towns, the Environmental Protection Agency, and the Nevada Department of Cultural Affairs; and 9,153 individual citizens. In response, the Park Service adopted a final plan committing to manage the lake for a range of recreational settings, from primitive to urban, and expanding protections for water quality and the natural environment.24¶ ■ A draft EIS issued in 2001 for a contemplated high- speed rail line between Charlotte, N.C. and Wash- ington, D.C. drew between 500 and 600 written comments, raising concerns related to safety, noise, vibration, impact on property values, congestion, historic districts, tourism and access to the rail serv- ice. Fourteen government agencies commented, and 18 public meetings were held, drawing at least 650 people.25 Based on the EIS and the comments received, the Federal Railroad Administration and the Federal Highway Administration approved the route for the proposed rail line, with more detailed planning to follow.¶ In sum, NEPA functions as a critical tool for dem- ocratic government decision-making, establishing an orderly, clear framework for involving the public in major decisions affecting their lives and communities.

### A2: Delay

Delay inevitable-The counterplan doesn’t substantially add to it

Goldfarb-managing editor Boston College Environmental Affairs Law Review-91

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Regardless of whether an agency must perform an EIS, there is often a delay between the proposal for a project and the commencement of the project. Often the EIS could be completed without extending this interim period. Therefore, the courts should be influenced by potential delay only when the additional delay caused by the EIS could undermine the United States's economic or military security. Executive Order 12,114 anticipates the need for special rules in the event of armed conflict, **[462](http://www.lexis.com/research/retrieve?_m=0b66bbdfe44672a3085a27564f685e85&csvc=bl&cform=searchForm&_fmtstr=FULL&docnum=1&_startdoc=1&wchp=dGLzVzk-zSkAl&_md5=c8a6fa09cb34acf67f47c953140df8c8" \l "n462" \t "_self)** and courts should construe this provision narrowly.

Turn-delay is good if it avoids the net benefits

Goldfarb-managing editor Boston College Environmental Affairs Law Review-91

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Fourth, the delay caused by NEPA compliance would not automatically harm the United States's commercial status or national security. 459 The fact that environmental issues dominated the Economic Summit in Paris demonstrates that environmental and economic issues are both of utmost importance in the modern world. 460 No longer do economic concerns automatically override environmental concerns. The courts must balance the risk to the economy and the risk to the environment, and recognize that economic and environmental interests are not necessarily mutually exclusive. As the communique from the Paris Summit expressed, "good economic policies and good environmental policies are mutually reinforcing." 461

## Net Benefits

### A2: Plan is small issue

Should err on the side of caution-Even small projects risk big environmental consequences

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**ARTICLE: Environmental Law and International Assistance: The Challenge of Strengthening Environmental Law in the Developing World**

One way is to mandate the production of an EIA in certain instances. Many nations have promulgated lists (often as a statutory annex) that designate the kinds of projects that require EIAs. 119 EIAs, for example, could be automatically triggered by large construction projects or proposals with major land requirements. Such lists must be carefully developed for there is a natural tendency to list only large-scale actions and thereby limit the application of EIA to large projects. 120 The rationale behind such limits seems to make sense (at first blush at least) since they assist nations with limited resources to target their EIAs on problems which generally present more potential for harm. 121 Many small projects, however, may present grave problems - a small parking lot in the midst of a historic district (such as Stone Town in Zanzibar); a relatively small irrigation scheme that may destroy a productive wetland; or one more tourist hotel, however modest, which may irrevocably alter the nature of a coral coast. At the same time, many larger projects (such as another major office building or a large parking lot in an already developed and modern downtown area) may pose only nominal impact. The question is really one of environmental significance and not the amount of money involved so that significance should be driven by the context of the proposal and the severity of the impact within that context. 122 Thus, the problem with lists is that they can all too easily be both under-inclusive and over-inclusive.

### A2: CP doesn’t spillover

#### The counterplan sends a key signal to the private sector to incorporate climate adaptation into their future investment decisions.

Neumann ’09 – Resources for the Future think tank [Resources for the Future, “Adaptation to Climate Change: Revisiting Infrastructure Norms”, December 2009, Resources for the Future Issue Brief 09-15, <http://www.rff.org/rff/documents/RFF-IB-09-15.pdf>]

The main threats presented by climate change to infrastructure assets include damage or

destruction from extreme events, which climate change may exacerbate; coastal flooding and

inundation from sea level rise; changes in patterns of water availability; and effects of higher

temperature on operating costs, including effects in temperate areas and areas currently

characterized by permafrost conditions. Almost half of the more than $60 billion annual federal infrastructure investment is for highways (in excess of $30 billion annually), with smaller but significant capital expenditures in dams and flood control (about 12 percent of the total), mass transit (about 11 percent), and aviation (about 9 percent). The federal role relative to state, local, and private roles is also highest in the transportation subsector. **The best opportunity for the federal government to** influence and enhance infrastructure’s adaptive capacity is thus in the transportation sector**.** In almost all cases, some adaptive capacity exists to respond to these threats through both public and private sector actions, but adaptive capacity can be significantly enhanced in the public sector by adopting three key policy reforms. 􀁺 First, although most public infrastructure is maintained as a capital asset, with annual operating, maintenance, and repair functions and a periodic replacement schedule, adopting a formal asset management approach could yield immediate benefits **and provide a framework for incorporating climate forecasts to enhance adaptive capacity.** 􀁺 Second, **the location of major capital infrastructure should be mapped against those areas of the country considered most vulnerable to climate stress,** and that information should be used to guide current and future investment in public infrastructure. These results should be actively publicized to most effectively signal the private sector about the expectations and limits of federal infrastructure provision. 􀁺 Third, efforts must begin to update infrastructure design standards to ensure that future infrastructure capital is more resilient to anticipated climate change and extreme events.

### Turns the Case

### GENERAL

#### **Climate change is increasingly impacting transportation infrastructure-Now is the key time to develop adaptation strategies.**

Transportation Research Board of the National Academies ’11 [Transportation Research Board, “ Adapting Transportation to the Impacts of Climate Change”, June 2011, Transportation Research Circular, E-C152, <http://www.trb.org/Publications/Blurbs/165529.aspx>]

**In 2010, transportation** **agencies** in Tennessee, Rhode Island, and Iowa **saw** firsthand **the effect of extreme rainfall** events that brought severe flooding and a wide range of impacts to the transportation system. These effects are likely to be early signs of climate change. • March 2010: Rhode Island experienced record flooding due to intense rainfall, not just once but twice. The unprecedented rainfall forced closure of 98 roads and 20 bridges, including closure of critical parts of Interstate 95 for 36 hours. To avoid having to also close nearby I-295, Rhode Island Department of Transportation (DOT) used thousands of sandbags and pumper trucks from the Warwick Fire Department. Ten days after the worst rainfall, 15 roads and bridges were still closed despite heroic efforts by 150 Rhode Island DOT maintenance crews and 50 engineering crews working around the clock to get them open. • July–August 2010: In July, northeast Iowa saw torrential rainfall (as much as 9 in. in places) that pushed the Maquoketa River to 23.92 ft—more than 2 ft above its previous record of 21.66 ft in 2004. In August, intense waves of thunderstorms over 3 days fell on already-saturated ground and forced closure of I-35 northbound and southbound near Ames, Iowa, along with many other roadways. Just 2 years earlier, in 2008, Iowa experienced record Traffic on I-40, a major east–west corridor across the United States, halted in West Nashville, Tennessee, due to flood waters after heavy rainfall in May 2010. Burbank 11 levels of flooding that closed roads and damaged roads and bridges. Iowa DOT’s website carries sites that feature dozens of pictures of the impacts of the 2008 flooding and the 2010 flooding. • **May 2010**: On May 1–2, **rainfall in Nashville, Tennessee, was more than double the previous record** for a 2-day period—and the previous record was set during a hurricane. Forty-one counties suffered highway and bridge damage, including a large landslide that covered parts of US-70. In Maury Country, two sections of State Route 7 sank as much as 20 ft below its original elevation due to ground saturation and collapse of pavement. Multiple sinkholes emerged, including a large sinkhole in eastbound I-24 that was 25 ft wide and 25 ft deep, which emerged 2 weeks after the flooding. **Estimated impacts included 100 routes affected, $45 million in repair costs, and 83,000 state DOT maintenance hours to assess damage and recover.** Severe rainfall is one of the signs of climate change. Warmer temperatures put more moisture in the air and increase the probability of more severe precipitation—greater rainfall in short periods, occurring more often. Scientists and weather experts who track the climate are convinced that climate change is already happening, at a faster rate than climate models predicted a few years ago, and that many parts of the world will see this intensify over time. The 2010 experiences of transportation agencies in Iowa, Tennessee, and Rhode Island are likely to be repeated there and elsewhere in future years, making it important to begin climate adaptation planning now to evaluate the new vulnerabilities and risks associated with climate change, to develop plans for coping with these events, and to incorporate these risks into asset management and infrastructure design for the future.

#### Climate change poses threat to transportation infrastructure, safety, and economy

FHWA 10’ [Federal Highway Administration, US Department of Transportation, “Regional Climate Change Effects: Useful Information for Transportation Agencies”, http://www.fhwa.dot.gov/environment/climate\_change/adaptation/resources\_and\_publications/climate\_effects/effects03.cfm]

"Climate affects the design, construction, safety, operations, and maintenance of transportation infrastructure and systems. The prospect of a changing climate raises critical questions regarding how alterations in temperature, precipitation, storm events, and other aspects of the climate could affect the nation's roads, airports, rail, transit systems, pipelines, ports, and waterways." CCSP 2008a

The changing climate poses serious challenges to the transportation community, given the community's need to watch over transportation systems and infrastructure designed to last decades or longer. Transportation functions tied to construction, operations, maintenance, and planning should be grounded in an understanding of the environment expected to support transportation facilities. Decisions therefore need to be informed by an understanding of potential future changes in climate… Why should the transportation community care about this information? The impacts of climate change can include weakened bridges and road beds, temporarily or permanently flooded roads, damaged pavements, and changes in road weather that can affect safety and economic activity. Understanding and proactively addressing the potential impacts of climate change can help avoid the potential damage, disruption in service, and safety concerns that climate change may cause.

#### **Climate change is increasingly impacting transportation infrastructure-Now is the key time to develop adaptation strategies.**

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### RAILROADS

#### Climate change can seriously hinder railroad safety, efficiency, and property

Rossetti, ’02[Micheal A. Rossetti, Michael Rossetti is a Strategic Planner and Economist at the DOT Volpe Center. He has served as Executive Agent for the DOT/NSTC initiative on Enhanced Transportation Weather Services. He is member of the User Advisory Group of the US Weather Research Program, and of the OFCM Joint Action Group on Weather Information for Surface Transportation. He is the author of many DOT publications on transportation statistics, and technology development. Previously, he was employed at the Federal Communications Commission and National Research Council. Mr. Rossetti holds a M.A. degree from the Pennsylvania State University and an A.B. from Boston College, “The Potential Impacts of Climate Change on Transportation”, 2002, http://climate.dot.gov/documents/workshop1002/rossetti.pdf]

Weather is a major influence on many aspects of the transportation system: particularly safety, mobility,¶ accessibility, economic efficiency, and infrastructure. While the nature and extent of this influence may vary¶ between modes, all modes are affected. Railroads are no exception, and in fact suffer from a variety of atmospheric and environmental factors, many of which are unique to this particular mode and deserving of special focus by the¶ transportation and meteorological communities.¶ Weather adversely affects railroad safety, efficiency, and property in many ways. Intermodal crossing points, such¶ as grade crossings and waterway/railroad trestle intersections are vulnerable, as are remote stretches far removed¶ from observational networks. Railroads may also be subject to sudden weatherinduced¶ mode shifts, such as occurred during the East Coast blizzard of January 1996.¶ Precipitation and fog lead to decreased visibility of signals to locomotive engineers. Flash floods can lead to¶ washout of tracks and consequent derailment. Seasonal floods from rivers may make some track segments¶ impassable. Warping of tracks due to uneven thermal expansion in the summer, or buildup of snow and ice on the¶ tracks in the winter, can lead to decreased speeds and derailment. Extreme cold causes brittle track and track¶ separation. Since railroad locomotives and cars are high-profile vehicles, high-speed crosswinds can influence their¶ stability.¶

#### Floods and flash floods will cause eventual devastation to railroad infrastructure

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Problems posed¶ by high waters from flash floods, river floods,¶ persistent heavy rains, and hurricanes have¶ historically been one of the most prominent¶ weather-related concerns facing the railroad¶ industry, as well as the nation as a whole. Some¶ climate models predict increased precipitation in¶ specific regions. This, along with faster melting¶ of mountain snow and seasonally high spring¶ water levels, may significantly impact railroad¶ operations in the next century.¶ Among weather events, floods annually¶ produce some of the largest amounts of¶ economic damage and fatalities. The¶ Midwestern river floods of 1993 devastated¶ railways, with over 4,000 miles of track either¶ flooded or idled and over $200 million in¶ estimated losses. A flash flood that weakened¶ an existing wooden trestle led to the 1997¶ Kingman, Arizona derailment of an Amtrak¶ passenger train that injured 183 and produced¶ damages of $7.2 million. The Kingman incident¶ generated a special FRA safety advisory,¶ concerning the use by railroads of official¶ weather watches and warnings.

#### Climate change causes increase in avalanches which poses threat to rails

Rossetti, ’02[Micheal A. Rossetti, Michael Rossetti is a Strategic Planner and Economist at the DOT Volpe Center. He has served as Executive Agent for the DOT/NSTC initiative on Enhanced Transportation Weather Services. He is member of the User Advisory Group of the US Weather Research Program, and of the OFCM Joint Action Group on Weather Information for Surface Transportation. He is the author of many DOT publications on transportation statistics, and technology development. Previously, he was employed at the Federal Communications Commission and National Research Council. Mr. Rossetti holds a M.A. degree from the Pennsylvania State University and an A.B. from Boston College, “The Potential Impacts of Climate Change on Transportation”, 2002, http://climate.dot.gov/documents/workshop1002/rossetti.pdf]

Aside from possible increases in the number of¶ floods, hurricanes, tornadoes, and other violent¶ storms, climatic fluctuations that produce¶ increased precipitation and greater temperature¶ swings are likely to trigger more earth, rock, and¶ snow slides in mountain areas. Because of the¶ mitigation efforts that the railroad industry has¶ 0taken, serious accidents, injuries, and fatalities¶ due to these natural hazards are relatively few,¶ but they still result in a considerable number of¶ disruptions and delays. As with any surface¶ transportation, slides can threaten the safety of¶ railroad operations, but slide mitigation planning¶ and implementation for railroads must consider¶ the following characteristics of railroad¶ operations and of the U. S. railroad network.¶ First, warnings must allow for trains to safely¶ stop in advance of a hazard. For heavy freight¶ trains or faster passenger trains on descending¶ grades, stopping distances are often between one¶ and two miles. Second, trains cannot steer¶ around even the smallest slides or obstructions.¶ And third, especially in the western U. S., there¶ are relatively few alternative railroad routes, and¶ the detour distances for accessing these may be¶ hundreds of miles long.¶

#### Temperature Extremes can pose numerous dangers to railroad infrastructure including uneven thermal expansion

Rossetti, ’02[Micheal A. Rossetti, Michael Rossetti is a Strategic Planner and Economist at the DOT Volpe Center. He has served as Executive Agent for the DOT/NSTC initiative on Enhanced Transportation Weather Services. He is member of the User Advisory Group of the US Weather Research Program, and of the OFCM Joint Action Group on Weather Information for Surface Transportation. He is the author of many DOT publications on transportation statistics, and technology development. Previously, he was employed at the Federal Communications Commission and National Research Council. Mr. Rossetti holds a M.A. degree from the Pennsylvania State University and an A.B. from Boston College, “The Potential Impacts of Climate Change on Transportation”, 2002, http://climate.dot.gov/documents/workshop1002/rossetti.pdf]

When exposed to the summer sun, railroad¶ tracks occasionally develop heat kinks that may¶ in turn create a hazardous condition for¶ oncoming traffic. Track misalignments caused¶ by sun kinks have often been identified as a¶ cause of train derailments with the potential for¶ injuries, fatalities, property damage, and toxic¶ release of hazardous materials. In addition to¶ the direct effect of solar radiation, railroad tracks¶ may also be exposed to uneven thermal¶ expansion when shade covers nearby sections,¶ thereby posing the risk of warp and¶ misalignment to freight traffic. A similar¶ condition may occur in winter, when extreme¶ cold results in brittle track, thus increasing the¶ risk of breakage. Cold temperatures are also the¶ cause of frozen air lines, when moisture present¶ in the distal part of the line cannot be dislodged¶ by heat from the locomotive.¶

#### Thunderstorms and Tornadoes create various problems for railroad infrastructure including efficiency and rail operations

Rossetti, ’02[Micheal A. Rossetti, Michael Rossetti is a Strategic Planner and Economist at the DOT Volpe Center. He has served as Executive Agent for the DOT/NSTC initiative on Enhanced Transportation Weather Services. He is member of the User Advisory Group of the US Weather Research Program, and of the OFCM Joint Action Group on Weather Information for Surface Transportation. He is the author of many DOT publications on transportation statistics, and technology development. Previously, he was employed at the Federal Communications Commission and National Research Council. Mr. Rossetti holds a M.A. degree from the Pennsylvania State University and an A.B. from Boston College, “The Potential Impacts of Climate Change on Transportation”, 2002, http://climate.dot.gov/documents/workshop1002/rossetti.pdf]

Exposed to weather in nearly all directions in¶ parts of the Midwest and western U.S., train¶ operators are often direct, in-line targets of¶ large-scale convection and supercells that¶ generate tornadoes. The FRA database reports¶ four tornadoes causing accidents during the¶ 1993-2002 period, but the actual effects are¶ likely much higher when slow orders or halts are¶ dispatched to train conductors, thus impeding¶ efficiency and cost-effectiveness. Similarly,¶ thunderstorm activity may harm rail operations¶ through various means, including lightning¶ strikes to switching equipment, flash floods of¶ poor drainage areas, and high winds associated¶ with microbursts and squall lines. Although a¶ separate meteorological phenomenon, intense¶ crosswinds that often set-up in the front range of¶ the Rocky Mountains may disrupt, halt, or even¶ force the rerouting of downwind rail traffic.¶

#### Tropical Cyclones pose serious concern for future railroad infrastructure

Rossetti, ’02[Micheal A. Rossetti, Michael Rossetti is a Strategic Planner and Economist at the DOT Volpe Center. He has served as Executive Agent for the DOT/NSTC initiative on Enhanced Transportation Weather Services. He is member of the User Advisory Group of the US Weather Research Program, and of the OFCM Joint Action Group on Weather Information for Surface Transportation. He is the author of many DOT publications on transportation statistics, and technology development. Previously, he was employed at the Federal Communications Commission and National Research Council. Mr. Rossetti holds a M.A. degree from the Pennsylvania State University and an A.B. from Boston College, “The Potential Impacts of Climate Change on Transportation”, 2002, http://climate.dot.gov/documents/workshop1002/rossetti.pdf]

Landfalling hurricanes along the Gulf and¶ Atlantic seaboards adversely affect¶ transportation interests and sometimes inflict¶ heavy damage to the infrastructure and assets of¶ the system. Railroads often sustain damage¶ from flooding, washouts, storm surges, and¶ debris flows associated with the passage of these¶ storms. Many notable examples appear in¶ historical records.¶ The effects of Hurricane Floyd on inland¶ North Carolina showed the importance of preexisting¶ soil moisture as a critical indicator of¶ flood potential in areas previously saturated by¶ heavy rains. Unable to absorb typical 10+ inch¶ rainfalls produced by landfalling storms, such¶ areas are especially vulnerable to rapid rises in¶ local streams and rivers. Flood amplification is¶ a real concern. Rain runoffs quickly undermine¶ structures such as dams, railroad beds, bridges,¶ and buildings. Outputs of land-surface models¶ help by providing risk estimates of land surface¶ temperatures, soil moisture, and surface wetness,¶ where wetness depends on precipitation and soil¶ texture. Land surface temperatures fall during¶ the passage of a hurricane. This decrease in¶ temperature also then decreases evaporation¶ levels.¶

### AIRPORTS

#### Warmer summers would require infrastructure change for airports – or aircraft would have to carry lighter cargo.

Caldwell et al [no date] – Harry Caldwell is the Chief of Freight Policy for the Federal Highway Administration, Kate H. Quinn is the Assistant Division Administrator of the Federal Highway Administration’s Indiana Division Office, Jacob Meunier, Ph.D. is an Analyst of Cambridge Systematics with experience in transportation planning and policy-making, John Suhrbier is a Principal of Cambridge Systematics, and Lance R. Grenzeback is a Principal and Senior Vice President of Cambridge Systematics [Department of Transport, “Potential Impacts of Climate Change on Freight Transport”, No Date, DOT, <http://climate.dot.gov/documents/workshop1002/caldwell.pdf> AD]

**Warmer summer weather will also have important implications for safety, operations, and maintenance**. First, it will make the need to refrigerate perishable goods all the more critical. **Second, it will reduce engine combustion efficiency. This will place a particular burden on air carriers because aircraft will require longer runways or lighter loads.** **Third, on extremely hot days it will preclude certain maintenance efforts that require prolonged outdoor exposure.**

#### Hotter temperatures result in reduced airplane efficiency.

Union of Concerned Scientists ’09 [UCS, “Climate Change in the United States”, August 2009, <http://www.ucsusa.org/assets/documents/global_warming/climate-costs-of-inaction.pdf> AD]

Air travel. Flooding at airports in coastal areas will affect air travel, and aircraft will need higher takeoff speeds and longer runways to obtain the extra lift required at higher temperatures. Recent hot summers have forced companies to cancel flights, especially at high-altitude locations. One analysis projects a 17 percent reduction in the freight-carrying capacity of a Boeing 747 at the Denver airport by 2030, and a 9 percent reduction for such an aircraft at the Phoenix airport, because of higher temperatures and more water vapor (NRC 2008)

#### Airports are needed, and their construction must take into account environmental changes.

UN Economic and Security Council ’10 [UN, “Policy options and actions for expediting progress in implementation: transport”, December 17, 2010, United Nations, <http://www.un.org/esa/dsd/csd/csd_pdfs/csd-19/sg-reports/CSD-19-SG-report-transport-final-single-spaced.pdf> AD]

Many are being implemented or are being planned, including roads and highways, railways, bridges and tunnels, sea and dry ports, airports, canals, waterways and pipelines. **Comprehensive and inclusive technical** and financial **planning, including** detailed social and **environmental impact assessment studies, remain critical to ensure the long-term sustainability of such investments**. 54. **Planning sustainable transport systems, including long-distance cross-border transport corridors, requires well-coordinated multi-modal integration. The construction or expansion of new** ports or **airports needs to be accompanied by the appropriate up-grading of transport infrastructure and services in the associated hinterland**. 55. Transport technologies and trade flows change over time. **With the rapid growth in air traffic, the capacities of inner-city airports are quickly becoming inadequate.** With growing containerization, many inner-city harbours also do not have the space needed for expansion. However, the relocation of transport activities can offer attractive opportunities for urban re-development, for example by converting former piers and warehouses into residential, commercial or recreational zones and facilities. 56. **Planning and construction of transport infrastructures need to anticipate potential long-term future changes.** River transport, waterways, canals and harbours can be affected by changes in precipitation, droughts or floods, or sea level rise. Appropriate and environmentally sustainable water management is thus essential.

#### Airport hazards laundry list.

Transportation Research Board of the National Academies ’11 [Transportation Research Board, “ Adapting Transportation to the Impacts of Climate Change”, June 2011, Transportation Research Circular, E-C152, <http://www.trb.org/Publications/Blurbs/165529.aspx> AD]

**The potential serious physical damage to the facilities and infrastructure of an airport mainly result from the changes in precipitation, temperature, sea level, storm surge, and winds**. The risks include flooding, heat buckle and other forms of expansion stress, permafrost thaw buckle in northern regions, perimeter security breaches, and fuel contamination or spills from pipe ruptures. As noted in the previous section, **secondary effects of climate change may also cause new risks**, such as extreme erosion, soil depletion, wild land fires, and facility damage from new species of animals and plants. Addressing potential physical damage from future climate change can generally be done • Rebuilding, relocating, or abandoning shoreline facilities (e.g., seawalls, sewage treatment outfalls, and building and runway foundations) to accommodate expected future higher sea levels It would be unusual for these types of physical improvements to be carried out in isolation from the regular process of continuous planning, design, development, and maintenance that typically goes on at any airport. Climate change adaptation actions for the physical plant can be seen as one of many objectives to be incorporated into the master planning and asset management process. This approach ensures that solutions are thought through in an integrated and comprehensive manner, to minimize the costs of the improvements and maximize the efficiency of the development process over time. The goal is to adapt to this new consideration of climate change in a way that still maximizes the utility of the often very long lived components of the airport infrastructure.

#### With climate change, weather is even going to be worse – this will hinder airports even more.

Morello ’11 – Lauren Morello is a writer for Scientific American [Scientific American, “NOAA Makes It Official: 2011 Among Most Extreme Weather Years in History”, June 17, 2011, Scientific American, <http://www.scientificamerican.com/article.cfm?id=noaa-makes-2011-most-extreme-weather-year>, AD]

The devastating string of tornadoes, droughts, wildfires and floods that hit the United States this spring marks 2011 as one of the most extreme years on record, according to a new federal analysis. Just shy of the halfway mark, 2011 has seen eight $1-billion-plus disasters, with total damages from wild weather at more than $32 billion, according to the National Oceanic and Atmospheric Administration. Agency officials said that total could grow significantly, since they expect this year's North Atlantic hurricane season, which began June 1, will be an active one. Overall, NOAA experts said extreme weather events have grown more frequent in the United States since 1980. Part of that shift is due to climate change, said Tom Karl, director of the agency's National Climatic Data Center.

#### Airports are particularly vulnerable to flooding.

Transportation Research Board of the National Academies ’11 [Transportation Research Board, “ Adapting Transportation to the Impacts of Climate Change”, June 2011, Transportation Research Circular, E-C152, <http://www.trb.org/Publications/Blurbs/165529.aspx> AD]

The committee noted the need for "a more strategic, risk-based approach to investment decisions that trades off the costs of making the infrastructure more robust against the economic costs of failure." **In the future, climate changes in some areas may necessitate permanent alterations. For example**, roads, rail lines, and **airport runways** in low-lying coastal areas **may become casualties of sea-level rise, requiring relocations or expensive protective measures, such as sea walls and levees.**

#### Floods threaten to destroy the Gulf Coast’s airports – but the damage caused by climate change won’t end there.

United States Global Research Program , no date[United States Research Program, “  
Transportation”, No date, USGRP, <http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts/climate-change-impacts-by-sector/transportatoin> AD]

**More frequent interruptions in air service and airport closures can be expected. Airport facilities including terminals, navigational equipment, perimeter fencing, and signs are likely to sustain increased wind damage. Airports are frequently located in low-lying areas and can be expected to flood with more intense storms.** As a response to this vulnerability, some airports, such as LaGuardia in New York City, are already protected by levees**. Eight airports in the Gulf Coast region of Louisiana and Texas are located in historical 100- year flood plains; the 100-year flood events will be more frequent in the future, creating the likelihood of serious costs and disruption**.217

#### San Francisco International Airport is located only 13 feet above sea level – it would be prone to flooding if sea levels rose.

Airport-Data ’12 citing the FAA [Airport Data, “San Francisco International Airport (SFO) Information”, 7/10/12, Airport Data.com, <http://www.airport-data.com/airport/SFO/>]

**San Francisco International Airport (SFO) Information** San Francisco, CA All Airports in California All Airports in United States Home FAA Information Maps Statistics Nearby Airports Hotels Weather Photos Aircraft Photos San Francisco International Airport (SFO) Airport Location & QuickFacts Owner & Manager Airport Operations and Facilities Airport Communications Airport Services Runway Information Radio Navigation Aids Remarks SFO Total 24 photos. View all photos Latest photos of San Francisco International Airport (SFO) by Bill Larkins by Bill Larkins by Bill Larkins by Bill Larkins Have a photo of this airport? Share with others. Location & QuickFacts FAA Information Effective: 2011-08-25 Airport Identifier: SFO Airport Status: Operational Longitude/Latitude: 122-22-29.6000W/37-37-08.3000N -122.374889/37.618972 (Estimated) **Elevation: 13 ft** / 3.96 m (Surveyed) Land: 5207 acres From nearest city: 8 nautical miles SE of San Francisco, CA Location: San Mateo County, CA Magnetic Variation: 17E (1975)

#### Two of the most important airports – JFK and Newark are only 10 feet above sea level.

Caldwell et al [no date] – Harry Caldwell is the Chief of Freight Policy for the Federal Highway Administration, Kate H. Quinn is the Assistant Division Administrator of the Federal Highway Administration’s Indiana Division Office, Jacob Meunier, Ph.D. is an Analyst of Cambridge Systematics with experience in transportation planning and policy-making, John Suhrbier is a Principal of Cambridge Systematics, and Lance R. Grenzeback is a Principal and Senior Vice President of Cambridge Systematics [Department of Transport, “Potential Impacts of Climate Change on Freight Transport”, No Date, DOT, <http://climate.dot.gov/documents/workshop1002/caldwell.pdf> AD]

The transport infrastructure of low-lying port cites, such as New York, Boston, Charleston, Miami, New Orleans, Texas City, San Jose, and Long Beach, could be particularly at risk. For example, New York’s La Guardia Airport, which is less than seven feet above sea level, already maintains a dike and pumps for floodwaters. **Newark International and John F. Kennedy International Airports are about 10 feet above sea level. In 2000, JFK was the country’s largest foreign trade gateway measured by value. Building higher retaining walls around floodprone airports is generally not a viable option, as these would interfere with aircraft takeoff and landing.**

#### Airports would be vulnerable to floods – especially those in New York.

#### **US Climate Action Report ’10** [State.gov “Vulnerability Assessment, Climate Change Impacts, and Adaptation Measures”, 2010, <http://www.state.gov/documents/organization/140006.pdf>AD]

**The U.S. transportation network is vital to the nation’s economy, safety, and quality of life.** Transportation accounts for approximately one-third of total U.S. GHG emissions. While it is widely recognized that emissions from transportation have impacts on climate change, **climate will also likely have significant impacts on transportation infrastructure and operations** (Karl et al. 2009; U.S. DOT 2006). Examples of specific types of impacts include softening of asphalt roads and warping of railroad rails; damage to roads and opening of shipping routes in polar regions (McCarthy et al. 2001); flooding of roadways, rail routes, and airports from extreme events and sea level rise; and interruptions to flight plans due to severe weather (Karl et al. 2009). Along the Gulf Coast alone, it is estimated that 3,864 kilometers (2,400 miles) of major roadways and 396 kilometers (246 miles) of freight rail lines are at risk of permanent flooding within 50–100 years as climate change and land subsidence combine to produce an anticipated relative sea level rise in the range of 1.2 meters (4 feet). In Alaska, the cost of maintaining the state’s public infrastructure is projected to rise 10–20 percent by 2030 due to warming, costing the state an additional $4–$6 billion, with roads and airports accounting for about half this cost (Karl et al. 2009**). In New York City, what is now a 100-year storm is projected to occur as often as every 10 years by late this century. Portions of lower Manhattan and coastal areas of Brooklyn, Queens, Staten Island, and Long Island’s Nassau County would experience a marked increase in flooding frequency. Much of the critical transportation infrastructure**, **including** tunnels, subways, and **airports, lies well within the range of projected storm surge and would be flooded during such events** (Karl et al. 2009).

#### Weather causes 70 percent of aircraft delays, cost 3 billion dollars, and sometimes, lives. With climate change, more severe weather will affect more people.

Kulesa [no date] - Gloria Kulesa is the Team Leader for the FAA’s Aviation Weather Research Program [Department of Transportation, “Weather and Aviation: How Does Weather Affect the Safety and Operations of Airports and Aviation, and How Does FAA Work to Manage Weather-related Effects?”, No Date, DOT, <http://climate.dot.gov/documents/workshop1002/kulesa.pdf>, AD]

According to FAA statistics, weather is the cause of approximately 70 percent of the delays in the National Airspace System (NAS). Figure 1 illustrates that while weather delays declined with overall NAS delays after September 11th, 2001, delays have since returned to near-record levels. In addition, weather continues to play a significant role in a number of aviation accidents and incidents. While National Transportation Safety Board (NTSB) reports most commonly find human error to be the direct accident cause, weather is a primary contributing factor in 23 percent of all aviation accidents. The total weather impact is an estimated national cost of $3 billion for accident damage and injuries, delays, and unexpected operating costs. Thunderstorms and Other Convective Weather. Hazards associated with convective weather include thunderstorms with severe turbulence, intense up- and downdrafts, lightning, hail, heavy precipitation, icing, wind shear, microbursts, strong low-level winds, and tornadoes. According to National Aviation Safety Data Analysis Center (NASDAC) analysis, between 1989 and early 1997, thunderstorms were listed as a contributing factor in 2-4 percent of weather-related accidents, depending on the category of aircraft involved. Precipitation was listed as a factor in 6 percent of commercial air carrier accidents, roughly 10 percent of general aviation accidents, and nearly 19 percent of commuter/air taxi accidents. American Airlines has estimated that 55 percent of turbulence incidents are caused by convective weather. In addition to safety, convective weather poses a problem for the efficient operation of the NAS. Thunderstorms and related phenomena can close airports, degrade airport capacities for acceptance and departure, and hinder or stop ground operations. Convective hazards en route lead to rerouting and diversions that result in excess operating costs and lost passenger time. Lightning and hail damage can remove aircraft from operations and result in both lost revenues and excess maintenance costs. In Figure 1, the vast majority of the warm season delays are due to convective weather. In-Flight Icing. In the period 1989-early 1997, the NTSB indicated that in-flight icing was a contributing or causal factor in approximately 11 percent of all weather-related accidents among general aviation aircraft. Icing was cited in roughly 6 percent of all weather-related accidents among air taxi/commuter and agricultural aircraft. The percentage was 3 percent for commercial air carrier accidents. The 1994 crash of an ATR-72 near Roselawn, Indiana, which claimed 68 lives, took place during icing conditions. In-flight icing is not only dangerous, but also has a major impact on the efficiency of flight operations. Rerouting and delays of commercial carriers, especially regional carriers and commuter airlines, to avoid icing conditions lead to late arrivals and result in a ripple effect throughout the NAS. Diversions en route cause additional fuel and other costs for all classes of aircraft. Icing poses a danger to aircraft in several ways: · Structural icing on wings and control surfaces increases aircraft weight, degrades lift, generates false instrument readings, and compromises control of the aircraft. See Figure 2. · Mechanical icing in carburetors, engine air intakes, and fuel cells impairs engine performance, leading to reduction of power.

### PORTS

#### Climate change is a major threat to US ports

AAPA and ICF International 08

http://www.epa.gov/sectors/pdf/ports-planing-for-cci-white-paper.pdf

The principal resource for predictions of global climate change is the United Nations Intergovernmental Panel on Climate Change (IPCC). In its Fourth Assessment Report, published in 2007, the IPCC estimated that global average sea level will rise from 18 to 59 cm (7.1 to 23.2 inches) by the last decade of the 21st century. The IPCC further concluded that because of global warming, thermal expansion of the oceans will likely continue to increase sea levels for many centuries after greenhouse gas (GHG) concentrations in the atmosphere have stabilized. These predictions are adequate for long-term projections of impact on ports at a global scale. A January 2008 study for the Organization for Economic Cooperation and Development (OECD) analyzed how climate change could affect the exposure of the world’s 136 largest port cities to coastal flooding due to storm surge by the 2070s. The study took into account the anticipated effects of climate change (sea-level rise and increased storm intensity) as well as worldwide economic and population growth projections. When the cities are considered as a group, there is near certainty (99.9% chance) that at least one of them will be affected by in a 1- in-100 year flood event in any given five year period. When ranked by the number of people that would be exposed to a 1-in-100-year flood event, three U.S. port cities (New Orleans, Miami and New York-Newark) were in the top twenty-five. When ranked by the value of assets exposed, six U.S. cities ranked in the top twenty-five (including the three above) and ten ranked in the top fifty.6 These predictions indicate that several U.S. port cities have a high risk of adverse impacts from climate change, but they do not consider that these cities and their ports may implement particular adaptation measures.

#### Climate change will force ports to shut down

Becker et al, 11 (Austin Becker, PhD Student at Stanford University, Emmett Interdisciplinary Program for Environment and Resources; Satoshi Inoue, Visiting Professor at Stanford, National Graduate Institute for Policy Studies, Tokyo, Japan; Martin Fischer, Director, Center for Integrated Facility Engineering; Professor, Civil and Environmental Engineering, Stanford University; Ben Schwegler, Chief Scientist of Walt Disney Imagineering R&D and Consulting Professor at Stanford

University; “Considering Climate Change: a Survey of Global Seaport Administrators; http://cife.stanford.edu/sites/default/files/WP128.pdf)

In a 2007 study, Nicholls et al. analyzed 136 port cities around the world to quantify ¶ current and future exposure to a 1-in-100 year flooding event. Their findings suggest that many ¶ of these areas have significant percentages of their GDP in areas that are at high risk today and ¶ climate change will increase that risk significantly. By 2070, for example, the combined effect of ¶ climate change, urbanization, increased population, and land subsidence could put 150-million ¶ people and US $35,000 billion (9% of projected global GDP) of assets at direct risk (Nicholls ¶ 2007). Though their study focused on “port cities,” as opposed to the ports themselves, the ¶ results serve as a useful indicator to the urgency of climate-change adaptation for the ports that ¶ are economic engines for these regions. Even outside of catastrophic damages, ports can expect ¶ “downtime” to increase with climate change. Larger storms in Japan, for example, could lead to ¶ more port shutdowns. Esteban (2009) shows that without taking proactive steps toward ¶ adaptation, the increased frequency of wind events could reduce the potential Japanese GDP by ¶ between 1.5 and 3.4% by 2085. Hallegate (2007) looked more specifically at the impact of ¶ hurricane intensity and found that just a 10% increase in storm intensity would increase annual ¶ hurricane damages in the US by 54%, from $8 billion to $12 billion per year. Another recent ¶ study found that surrounding port lands at 35 of 44 Caribbean ports will be inundated by 1m of ¶ SLR, unless protected by new coastal structures (Simpson et al. 2010).

### Waterways

#### Changes in precipitation will damage all infrastructure – Waterways are the greatest risk of catastrophe.

NTPP ‘9 (National Transportation Policy Project, Bipartisan coalition of transportation policy experts, business and civic leaders, and is chaired by four distinguished former elected officials who served at the federal, state, and local levels, Published December 15 2009, Bipartisan Policy Center, <http://bipartisanpolicy.org/sites/default/files/Transportation%20Adaptation%20(3).pdf>)

Projected changes in annual precipitation are ¶ not consistent across the United States, with ¶ regional models showing increases in some areas ¶ and decreases in others. Increasing rates of annual average precipitation can render stormwater ¶ facilities inadequate, lead to deteriorating water ¶ quality due to run-off and sedimentation, degrade ¶ infrastructure, and change soil conditions (with ¶ impacts such as subsidence and heave, landslides, ¶ and structural instability). Decreasing precipitation rates also can create problems, particularly in ¶ drying and shrinking of soils, affecting the base ¶ under pavements and other structures. Warming ¶ temperatures also will likely result in a shift from ¶ snowfall to rainfall, potentially relieving areas that ¶ typically see large amounts of snow from some of ¶ the cost of maintaining winter roads.¶ A potentially more signiﬁcant concern across the ¶ nation is a projected increase in the intensity of¶ precipitation events. Extreme rainfall events can ¶ overwhelm stormwater management systems, ¶ lead to more ﬂooding, and increase run-off issues throughout the nation. For instance, Tropical ¶ Storm Allison caused widespread ﬂooding of ¶ Houston’s freeway system in 2001 due not to ¶ storm surge, but rather to the intensity, and duration of the rainfall. ¶ Changes in precipitation, coupled with increasing ¶ temperatures, also will have important effects on ¶ the nation’s inland waterway system. The Great ¶ Lakes are projected to experience declining water ¶ levels that will impair shipping; for each inch of ¶ lost draft a 1,000-foot bulk carrier loses 270 tons ¶ of capacity.¶ 13¶ If lower water levels occur on a regular basis, Great Lakes shippers will be less competitive with other competing modes such as rail or ¶ truck.¶ 14¶ Declining water levels would also result in ¶ increased costs and environmental impacts from ¶ increased dredging. Projections are less certain for ¶ the Mississippi River system, but both drought ¶ and ﬂood conditions can stop barge trafﬁc on the ¶ river system, greatly affecting the ability to move ¶ agricultural products from the interior to market.

\*Note to reader: My home town will go broke if this happens

#### Warming would make shipping more difficult: lower lake and river levels mean that larger ships could not pass through existing lanes.

**Department of Transportation - DOT Center for Climate Change and Environmental Forecasting ‘2** [DOT, “The Potential Impacts of Climate Change on Transportation”, October 2002, Federal Research Workshop, <http://climate.dot.gov/documents/workshop1002/workshop.pdf>, AD]

**What are some** other **aspects of this¶ Assessment that are directly relevant to¶ transportation**? First, future conditions were¶ evaluated by using results from state of the art¶ climate model simulations in impacts studies,¶ and by using results from the current scientific¶ literature. Some of the relevant results include:¶ • Some **climate models show a reduction in¶ soil moisture** in many areas resulting in¶ decreases in ground and surface water¶ supplies. This **could result in a decrease in¶ the levels of the Great Lakes by as much as¶ a meter or more.** However, other model¶ results suggest little change in lake levels.¶ **Reductions in base stream flow could cause¶ problems with transportation such as barge¶ shipping, infrastructure, and reductions in¶ water supply**. However, warmer winter¶ temperatures could result in a longer ice-free¶ season thereby extending the shipping¶ season on the Great Lakes.¶ • A possible reduction in Western U.S.¶ snowpack that would impact water supply¶ and streamflow. This could result in a¶ seasonal redistribution of water availability.¶ • In Alaska, permafrost has already undergone¶ extensive melting and if future projections¶ of high-latitude warming hold, then melting¶ would continue.¶ • Heavy precipitation events in the U.S. have¶ increased over the 20th century, and could continue with a more vigorous hydrologic¶ cycle as projected by model scenarios.¶ • Increasing summer temperatures, coupled¶ with increasing water vapor, would likely¶ result in increases in the summer-time heat¶ index in many parts of the country.

### LOCKS

#### Lower water levels damage lock cells- become vulnerable to damage

IWAC 09 Inland Waterways Advisory Council in England and Whales [<http://www.iwac.org.uk/downloads/reports/IWAC_Climate_Change_Inland_Waterways_Apr09.pdf> “Climate change mitigation and adaptation – implications for inland waterways in England and Wales” April 2009]

Navigation authorities will need to ensure that their routine asset monitoring and maintenance activities identify any structures which could potentially be vulnerable if low flow/drought conditions reduce or remove hydraulic support from the waterside face. Structures which could be vulnerable in the event of rapid drawdown should similarly be identified and monitored. In both cases, if significant risks are identified the **structures will need to be strengthened or modified accordingly** (or rapid drawdown avoided where possible). **Lower water levels may occasionally result in damage to lock cills** (e.g. if deeper drafted craft impact upon them). Steps should therefore be taken to ensure that a minimum under-keel clearance is maintained. Alternatively it may be necessary to close the navigation until water levels recover sufficiently to remove the risk. **Lock and bridge approaches may** similarly **become more vulnerable to damage as craft attempt to sail in shallower conditions**. However, **long term dredging should be used to address this issue** as good practice would require such approaches to be cleared. Finally, as discussed in Section 6.7, whenever significant modifications or made to existing infrastructure, or when new assets are being planned, care should be taken to future-proof such activities. This will help to ensure that such infrastructure will be able to withstand the projected future effects of climate change over its design life.

#### Lock climate change adaption key to prevent breakage- ensures bank stability

IWAC 09 Inland Waterways Advisory Council in England and Whales [<http://www.iwac.org.uk/downloads/reports/IWAC_Climate_Change_Inland_Waterways_Apr09.pdf> “Climate change mitigation and adaptation – implications for inland waterways in England and Wales” April 2009]

Other players in inland waterways management organisation. When measures to address the potential effects of climate change and their consequences for inland waterways and inland navigation are being considered, a number of important inter-relationships therefore need to be taken into account. Some such inter-relationships are related to The characteristics of many inland waterways in England and Wales are such that infrastructure may have a dual function or its operation may involve more than one planning and/or policy, whilst others have more practical implications. **Of** particular **importance in this respect are flood risk management and water resources**. The **embankments of many navigable waterways are also flood defences. Locks, weirs, sluices and other structures may similarly have a flood risk management role, and the compatibility of flood risk management and navigation requirements needs to be taken into account**, particularly in times of extreme events. Whereas **high flows can sometimes make it difficult or indeed dangerous to operate locks**, there may be a specific requirement for locks to be held open to facilitate flood conveyance downstream. Active management of weir structures may similarly be used to modulate storm pulses. According to Environment Agency (2007), **channel maintenance for flood risk management purposes and/or for navigation is** likely **to become a key part of the response to climate change** - in particular **to ensure bank stability** and to keep rivers open during low flow. There is a great deal of ongoing research into flood risk management requirements under a scenario of climate change and this report does not attempt to repeat or duplicate such work. Rather, it aims to highlight the need for close cooperation between flood risk and navigation personnel, both in the operation and maintenance of existing assets and in the planning and design of future new or modified infrastructure. In particular, such activities need to take into account the sometimes differing requirements and to endeavour to identify ‘win-win’ solutions which meet the needs of both activities. In addition to increased precipitation and flood risk management considerations, low flow and drought conditions are relevant to this report, as the operation of locks may need to be restricted in order to reduce drainage and maintain water in the network - not only to conserve ecological interests but also to help maintain the structural integrity of flood embankments, etc. The use of back-pumping to continue to allow boat passage through locks also needs to be undertaken in a way that takes account of other interests. A number of navigations also form part of large low-level drainage systems which are managed by Internal Drainage Boards (IDB), for example the Middle Level Commissioners in the Fens. IDBs often discharge their drainage systems via pumping stations to main rivers which may be part of a navigation system - such as the River Witham in Lincolnshire. Such discharges typically increase when there is already sufficient water in the river to support navigation. However other, potential mutually beneficial water management opportunities might be explored under a scenario of climate change.and is likely to play a leading role in developing and coordinating strategies to deal with the impacts of climate change.

#### Lock breakage leads to water loss, and causes species to go extinct, largely affecting habitat in the area

IWAC 09 Inland Waterways Advisory Council in England and Whales [<http://www.iwac.org.uk/downloads/reports/IWAC_Climate_Change_Inland_Waterways_Apr09.pdf> “Climate change mitigation and adaptation – implications for inland waterways in England and Wales” April 2009]

**Reduced precipitation and** associated **low flow** conditions **have the potential to affect aquatic habitats** detrimentally, including marginal areas **and adjacent wetlands**. If water levels drop, **water-dependent species of flora and fauna are vulnerable** and their Restoration and use of historic side ponds at locks could save water. This principle is also used in ‘economiser’ locks on major modern waterways in continental Europe.**survival may be compromised**. Depending on the duration of the event, certain **plant species may die-back or be lost and associated insects, fish and birds might be threatened as a result** - **through losing a source of food, through exposure to predators or due to an interruption in up- and down-stream connectivity.** In addition to marginal or bankside habitats, nearby wetland areas may depend on navigable rivers and canals for their water supply, whether directly through side channels, via infrastructure such as sluices or, occasionally, through seepage. As a result of the historic loss of wetland habitats over many years (due to land drainage, infilling for development, etc.), many remaining wetland areas are protected under international, national or local initiatives. Depending on the nature of the protection, either the conservation agencies or the Environment Agency (e.g. through the designation of water protection zones, see Section 7.7) could require measures to be taken - which could, in turn, have implications for navigation. In some situations, **maintaining water levels to support wildlife will also be beneficial for navigation.**

**Similarly, where water loss is a result of drying out, fissuring or malfunction of navigation infrastructure such as** sluices or **locks**, it will be in the navigation authority’s interest to remedy the problem. In other cases, however, making water available to protect wildlife interests might further reduce the amount available for lock and sluice operations, etc. There is thus the potential for conflict, and careful management will be needed to ensure that a balance is achieved between the requirements of navigation and those of nature. As it seems likely that **low flow conditions will occur much more frequently due to climate change** (see Section 7.1), navigation authorities would benefit from an improved understanding of site-specific ecology-water interdependencies.Such an understanding would enable them to anticipate any problems, to explore potential ‘win-win’ opportunities to store excess winter rainfall (e.g. as discussed in Section 6.8) and to develop a contingency plan including measures such as releasing fresh water from storage where available or using lock, sluice and weir operation to aerate the water.Finally, in extreme low flow conditions, as water resources diminish during the summer season it will become increasingly important to retain sufficient water within the river reach or canal pound to protect the ecology. As a consequence, there may be situations in which the use of locks has to be temporarily suspended.

### Roads

#### We are not prepared for the impacts of climate change.

Highways Agency 11 (British(government) Highways Agency, “Climate Change Risk Assessment” August 2011 http://www.highways.gov.uk/aboutus/documents/HA\_Climate\_Change\_Risk\_Assessment\_August\_2011\_v2.pdf)

“We are not prepared for climate changes which occur, ¶ threatening both highway asset integrity and availability; and we ¶ fail to adequately manage the carbon emissions that lie within the ¶ Highways Agency’s sphere of inl uence, leading to loss of reputation ¶ and i nancial impacts from Carbon Reduction Commitment (CRC) ¶ penalties and higher energy consumption”¶ The cause of the risk can be identified as not targeting management ¶ actions nor timely and demonstrably reducing climate change risks ¶ defined by the organisation. Unmanaged, the consequence would ¶ be a deterioration in network integrity; increased maintenance ¶ liability; increased disruption to service from events such as flooding; ¶ increased risks to road users and operational staff from extremes in ¶ weather and risk to the ability of staff to access their place of work ¶ when extreme weather events occur.¶ The Agency has already experienced problems on the network due to ¶ extremes in rainfall and temperature. These occurrences are only likely ¶ to increase in their frequency and severity over time as the impacts ¶ of climate change increase. The majority of the network remains ¶ susceptible to weather events, with detrimental changes in asset ¶ integrity adversely affecting journey reliability and safety. In treating ¶ the risks posed, some changes to technical standards have already ¶ been made to increase resilience to climate changes including HD33 ¶ drainage standard and the Enrobé à Module Élevé 2 (EME2) revised ¶ pavement specification.

#### Rising sea levels pose a threat to low-lying roads

Austroads, 4 (Austroads, road transport and traffic authorities of Australia and New Zealand, “Impact of Climate Change on Road Infrastructure, http://www.bitre.gov.au/publications/2004/files/cr\_001\_climate\_change.pdf)

Sea level rise could be a concern for low-lying roads in coastal areas, particularly if the rise by 2100 is¶ towards the upper end of the projected range of 9 to 88 cm. The problem may be worse in northern Australia¶ if wind speeds become higher during storm surges. Planners and designers of roads and causeways in lowlying coastal areas can take account of projected rises in sea level over the lives of assets. The impact on¶ existing roads and causeways can be taken into account at the time they require rehabilitation or ¶ improvement. Clearances for new bridges over tidal water should take into account the potential rise in sea ¶ level over the life of the bridge, usually 100 years.

#### Climate change poses a host of risks to the highway network.

Walters 09 (Caroline, Researcher for URS Scott Wilson, a leading engineering and environmental consultant firm. “The Effect of Climate Change on 3CAP’s ¶ Highway Network Policies and Standards” The 3 Counties Alliance Partnership (3CAP) February 2009 http://www.leics.gov.uk/climate\_change\_adaptations.pdf)

A Risk and Probability Assessment of the effects of climate change on the highway network has ¶ identified the ten effects posing the biggest risks from climate change to the highway network ¶ (extracted from Table 9). • Pavement failure from prolonged high temperatures;¶ • Increased length of the growing season leading to prolonged and/or more rapid growth of the ¶ soft estate; ¶ • Lack of capacity in the drainage system and flooding of the network; ¶ • Surface damage to structures from hotter and drier summers; ¶ • Scour to structures from more intense rainfall; ¶ • Damage to pavement surface layers from more intense rainfall; ¶ • Subsidence and heave on the highway from more intense rainfall; ¶ • Scour and damage to structures as a result of stronger winds and more storminess; ¶ • Severe damage to light-weight structures from stronger winds and more storminess; and ¶ • Less disruption by snow and ice due to warmer winters.

#### Climate change accelerates the deterioration of highway systems.

Walters 09 (Caroline, Researcher for URS Scott Wilson, a leading engineering and environmental consultant firm. “The Effect of Climate Change on 3CAP’s ¶ Highway Network Policies and Standards” The 3 Counties Alliance Partnership (3CAP) February 2009 http://www.leics.gov.uk/climate\_change\_adaptations.pdf)

There have been an increasing number of very hot days (i.e. with temperatures over 25°C) in ¶ the East Midlands over the last 40 years. Extremely hotter summers have been experienced in ¶ 1976, 1983, 1990, 1995 and 2003, where high temperatures were sustained over a number of ¶ days ¶ regions such as Cambridgeshire and Hampshire reported significant problems with cracking ¶ and deformation of the highway as a result of a prolonged hot and dry period leading to a ¶ severe reduction in soil moisture content and soil shrinkage. Incidences similar to this are ¶ expected to increase in frequency and severity as climate change develops. ¶ However, hotter and drier summers do have the potential to provide some benefits for highway ¶ construction and maintenance. Although prolonged high temperatures can cause asphalt roads ¶ to soften and deform and concrete roads to crack, it also means that roads can be resurfaced ¶ rapidly and grass growth is reduced during the very hot periods, thus producing a short-term ¶ reduction in the need for grass cutting [Capps and Lugg, 2005]. These effects will help to ¶ reduce the costs and disruption associated with these particular maintenance activities during ¶ these particular periods of hot and dry weather. ¶ Wetter winters and more extreme rainfall events will lead to increased occurrences of flooding, ¶ as seen in the summer of 2007. This will particularly be a problem in low-lying areas as well as ¶ floodplains, and will increase the risk of landslips and embankment erosion. Flooding will also ¶ have implications on pavement maintenance as water ingress and binder stripping can lead to ¶ premature deterioration and failure of the pavement structure. More intense rainfall, increased ¶ storminess and more severe winds will have impacts on pavement resilience, drainage capacity ¶ and condition, utilities and highways structures (such as; bridges, culverts, road signs, street ¶ lighting). ¶ Warmer winters will lead to less snow and ice which should reduce the need for winter ¶ maintenance activities (salting etc). However, this will not necessarily reduce the need for winter ¶ maintenance resources and capabilities that are available for utilisation – conservative ¶ forecasting and an increase in the number of ‘marginal’ nights may in fact mean that the number ¶ of ‘turn-outs’ in winter is likely to remain the same or may even increase. ¶ Warmer winters and more intense rainfall events will also lead to a lengthened growing season. ¶ This will result in an increased demand and need for maintenance of the soft estate and new ¶ plant species may begin to thrive. This in turn will have additional potential impacts such as; ¶ drainage blockages, impaired ‘sight-line’ vision of road signs, and vegetation ingress onto the ¶ highway leading to pavement damage and deterioration.

#### **Extreme Heat damages roads and reduces life spans**

Meyer et. al. 09, (Michael Frederick R. Dickerson Professor, School of Civil and Environmental Engineering, Georgia Institute of Technology, PhD Michael Flood Senior Planner at Parsons Brinckerhoff ¶ Chris Dorney Transportation/Land Use Planner at Parsons Brinckerhoff ¶ Ken Leonard Principal of Cambridge Systematics, ¶ Robert Hyman Associate at Cambride Systematics ¶ Joel Smith expert on climate change policy, lead author of the Intergovernmental Panel on Climate Change 2001 and 2007 assessment report; the latter shared the Noble Peace Prize with former Vice President Al Gore. Vice-President of Stratus Consulting, Boulder, CO. “Climate Change and the Highway System: Impacts and Adaptation Approaches”. National Cooperative Highway Research Program. 5/6/2009 http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-83%2805%29\_Task2-3SynthesisReport.pdf)

The literature points to a likely increase in very hot days and heat waves. As discussed in section ¶ 3.2, heat extremes and heat waves will continue to become more intense, longer lasting, and more ¶ frequent in most regions during the 21st century (NRC, 2008). Increasing periods of extreme heat ¶ will place additional stress on infrastructure, reducing service life and increasing maintenance ¶ needs. ¶ Extreme maximum temperature and prolonged duration of heat waves are expected to lead to ¶ premature deterioration of infrastructure. Temperature increases have the potential to affect and ¶ reduce the life of asphalt road pavements through softening and traffic-related rutting (Karl et al., ¶ 2009; CNRA, 2009; Field et al., 2007; CSIRO, 2007; Maine DOT, 2009). Extreme heat can also stress ¶ the steel in bridges through thermal expansion and movement of bridge joints and paved surfaces ¶ (Karl et al., 2009; CSIRO, 2007; New York City Panel on Climate Change, 2009). ¶ The increase in very hot days and extended heat waves are expected to impact highway operations ¶ and maintenance in several ways. The first is the probable limit on construction activities and the ¶ number of hours road crews can work due to health and safety concerns for highway workers (Karl ¶ et al., 2009; Peterson et al., 2008). The increase in extreme heat could also lead to load restrictions ¶ on roads. Pavement damage and buckling will disrupt vehicle movements (Karl et al., 2009). ¶ Extreme heat could disrupt vehicle operations because of overheating and increased risk of tire ¶ blow-outs in heavily loaded vehicles (Karl et al., 2009; Peterson et al., 2008). Higher temperatures ¶ could lead to an increased need for refrigerated freight movement, and thus result indirectly in ¶ higher transportation costs (Karl et al., 2009; CNRA, 2009). ¶ A secondary impact of extreme and extended periods of heat, when combined with reduced ¶ precipitation, is the projected increased risk of wildfires, especially in the Southwest region. Fire ¶ poses a risk to infrastructure and travelers, and can necessitate road closures (Karl et al., 2009).

#### Increased temperature causes permafrost thaws which will cause landslides and destroy roads.

Meyer et. al. 09, (Michael Frederick R. Dickerson Professor, School of Civil and Environmental Engineering, Georgia Institute of Technology, PhD Michael Flood Senior Planner at Parsons Brinckerhoff ¶ Chris Dorney Transportation/Land Use Planner at Parsons Brinckerhoff ¶ Ken Leonard Principal of Cambridge Systematics, ¶ Robert Hyman Associate at Cambride Systematics ¶ Joel Smith expert on climate change policy, lead author of the Intergovernmental Panel on Climate Change 2001 and 2007 assessment report; the latter shared the Noble Peace Prize with former Vice President Al Gore. Vice-President of Stratus Consulting, Boulder, CO. “Climate Change and the Highway System: Impacts and Adaptation Approaches”. National Cooperative Highway Research Program. 5/6/2009 http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-83%2805%29\_Task2-3SynthesisReport.pdf)

Changes in the projected range of temperatures, including seasonal changes in average ¶ temperatures, can also impact highway systems. The increase in range of temperatures will likely ¶ benefit highways in some ways, while increasing risks in others. ¶ Warmer winters will likely lead to less snow and ice on roadways, and incidence of frost heave and ¶ road damage caused by snow and ice in southern locations is likely to decline. However, in some ¶ regions warmer winters could also increase the freeze-thaw conditions that create frost heaves and ¶ potholes on road and bridge surfaces; particularly in northern locations that previously ¶ experienced below-freezing temperatures throughout much of the winter. They may lead to an ¶ increase in freeze-thaw conditions in northern states, creating frost heaves and potholes on road ¶ and bridge surfaces that increase maintenance costs: repairing such damage is already estimated to ¶ cost hundreds of millions of dollars in the U.S. annually (Peterson et al., 2008). ¶ In Alaska, warmer temperatures will likely adversely affect infrastructure for surface ¶ transportation. Permafrost thaw in Alaska will damage road infrastructure due to foundation ¶ settlement and is the most widespread impact (Larsen et al., 2008). Permafrost thaw will also ¶ reduce surface load-bearing capacity and potentially trigger landslides that could block highways. NCHRP 20-83 (5) Task 2.3 Synthesis Report ¶ Review of Key Climate Impacts to the Highway System ¶ and Current Adaptation Practices and Methodologies ¶ 27 ¶ Roadways built on permafrost already have been damaged as the permafrost has begun to melt and ¶ ground settlement has occurred leading to costly repairs for damaged roads. Dealing with thaw ¶ settlement problems already claims a significant portion of highway maintenance dollars in Alaska ¶ (Karl et al., 2009). A study in Manitoba, Canada, projects the degradation of permafrost beneath ¶ road embankments will accelerate because of warmer air temperatures. The symptoms of ¶ permafrost degradation on road embankments are lateral spreading and settlement of road ¶ embankments. This can create sharp dips in road surfaces which require extensive patching every ¶ year and lead to dangerous conditions for motorists (Alfaro et al., 2009). ¶ In Southern Canada, studies suggest that rutting and cracking of pavement will be exacerbated by ¶ climate change and that maintenance, rehabilitation, or reconstruction of roadways will be required ¶ earlier in the design life (Mills et al., 2009). Similarly, simulations for pavement in Alberta and ¶ Ontario show that temperature increases will have a negative impact on the pavement performance ¶ in the Canadian environment. As temperature increases, accelerated pavement deterioration due to ¶ traffic loads on a warmer pavement was expected and observed. An increase in temperature would ¶ facilitate rutting because the pavement is softer. Pavement movement due to loads on a softer ¶ pavement would also result in increased cracking. Overall temperature changes significantly ¶ affected the level of pavement distress for the international roughness index (IRI), longitudinal ¶ cracking, alligator cracking, AC deformation, and total deformation (Smith et al., 2008). ¶ The effects of changing temperatures are particularly apparent in the Arctic. Warming winter ¶ temperatures, especially in the high northern latitudes of Alaska, could cause the upper layer of ¶ permafrost to thaw. Over much of Alaska, the land is generally more accessible in winter, when the ¶ ground is frozen and ice roads and bridges formed by frozen rivers are available (NRC, 2008; Karl ¶ et al., 2009). Winter warming would therefore shorten the ice road season and affect access and ¶ mobility to northern regions. Thawing permafrost could also damage highways as a result of road ¶ base instability, increased slope instability, landslides and shoreline erosion. Permafrost melt could ¶ damage roads and bridges directly through foundation settlement (bridges and large culverts are ¶ particularly sensitive to movement caused by thawing permafrost) or indirectly through landslides ¶ and rockfalls. In addition, hotter, summers in Alaska and other mountainous western locations lead ¶ to increased glacial melting and longer periods of high stream flows, causing both increased ¶ sediment in rivers and scouring of bridge supporting piers and abutments. ¶ The change in range of maximum and minimum temperatures will likely produce both positive and ¶ negative impacts on highway operations/maintenance. In many northern states, warmer winters ¶ will bring about reductions in snow and ice removal costs, lessen adverse environmental impacts ¶ from the use of salt and chemicals on roads and bridges, extend the construction season, and ¶ improve the mobility and safety of passenger and freight travel through reduced winter hazards ¶ (Karl et al., 2009). ¶ On the other hand, warmer winter temperatures could also have negative impacts on highway ¶ operations and maintenance. Greater vehicle load restrictions may be required to minimize damage ¶ to roadways when they begin to subside and lose bearing capacity during the spring thaw period. ¶ With the expected earlier onset of seasonal warming, the period of springtime load restrictions ¶ might be reduced in some areas, but it is likely to expand in others with shorter winters but longer ¶ thaw seasons (Peterson et al., 2008)

#### Roads are particularly vulnerable to increased storm activity due to GW

NTPP ‘9 (National Transportation Policy Project, Bipartisan coalition of transportation policy experts, business and civic leaders, and is chaired by four distinguished former elected officials who served at the federal, state, and local levels, Published December 15 2009, Bipartisan Policy Center, <http://bipartisanpolicy.org/sites/default/files/Transportation%20Adaptation%20(3).pdf>)

Storms, particularly hurricanes, can cause major ¶ damage to transportation infrastructure. Increases ¶ in storm intensity will have signiﬁcant impacts ¶ throughout the United States, especially in coastal ¶ areas. Transportation infrastructure already experiences storm impacts, but may not be designed ¶ to withstand a greater number of high-intensity ¶ storm events. ¶ Among the most destructive effects of coastal ¶ storms are storm surges, which can cause ¶ temporary disruptions (inundation of facilities ¶ that renders them inoperable until the surge ¶ subsides) and permanent damage, destroying ¶ bridges, pavement, and other structures. Hurricane Katrina storm surges, for instance, destroyed ¶ billions of dollars in infrastructure, including ¶ miles of coastal roads and rails and several major ¶ highway bridges. Storm surges will be exacerbated ¶ by further rising sea level, putting a greater range ¶ of infrastructure at risk. For instance, a Florida ¶ State University (FSU) study found that even if ¶ hurricane intensity did not change, sea-level rise ¶ of just one foot would triple the frequency of a ¶ seven-foot storm surge in coastal Florida from ¶ once every 76 years to once every 21 years.¶ 11¶ Changes in storm intensity, particularly when ¶ coupled with sea-level rise, will have major implications for emergency management as well. ¶ Low-lying evacuation routes may not be available in the future, and the increase in frequency ¶ of evacuations will call for additional resources ¶ devoted to the problem. Offshore pipelines are ¶ also vulnerable to hurricanes, with wave action ¶ and seabed erosion particularly affecting pipelines ¶ in shallow waters (as found in the Gulf of Mexico ¶ petroleum collection networks). Larger on-shore ¶ pipelines also face disruption from storm-induced ¶ power outages. For instance, after Hurricane ¶ Katrina, gasoline shortages were experienced along ¶ the East Coast because pipelines originating in the ¶ storm-damaged region were not operating from ¶ lack of power.¶ 12¶ Not all impacts are restricted to coastal storms and ¶ hurricanes. High storm winds also cause damage ¶ to signage and overhead cables, as well as to warehouse facilities at intermodal sites (which tend ¶ to be lightly built), and disrupt roadway operations with downed trees and debris. Potentially ¶ increased storm activity could include an increase ¶ in lightning strikes, which can disrupt electronic ¶ transportation infrastructure, such as signaling.

#### **Changes in precipitation compromise the structure of our highways.**

Meyer et. al. 09, (Michael Frederick R. Dickerson Professor, School of Civil and Environmental Engineering, Georgia Institute of Technology, PhD Michael Flood Senior Planner at Parsons Brinckerhoff ¶ Chris Dorney Transportation/Land Use Planner at Parsons Brinckerhoff ¶ Ken Leonard Principal of Cambridge Systematics, ¶ Robert Hyman Associate at Cambride Systematics ¶ Joel Smith expert on climate change policy, lead author of the Intergovernmental Panel on Climate Change 2001 and 2007 assessment report; the latter shared the Noble Peace Prize with former Vice President Al Gore. Vice-President of Stratus Consulting, Boulder, CO. “Climate Change and the Highway System: Impacts and Adaptation Approaches”. National Cooperative Highway Research Program. 5/6/2009 http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-83%2805%29\_Task2-3SynthesisReport.pdf)

As discussed in section 3.2, changes in precipitation – of both rain and snow - will vary widely ¶ across the various regions in the U.S. These changes are expected to impact highways in several ¶ ways, depending on the specific regional precipitation levels and geographic conditions. ¶ In areas with increased precipitation, there is greater risk of short and long term flooding (e.g. more ¶ spring floods in the upper Midwest). In other areas more precipitation may fall as rain rather than ¶ snow in winter and spring, increasing the risk of landslides, slope failures, and floods from the ¶ runoff which can cause road washouts and closures. In addition, northern areas are projected to ¶ have wetter winters, exacerbating spring river flooding. In other areas the increase in precipitation ¶ could lead to higher soil moisture levels affecting the structural integrity of roads, bridges, and ¶ tunnels and leading to accelerated deterioration. If soil moisture levels become too high, the structural integrity of roads, bridges, and tunnels, which ¶ in some cases are already under age-related stress and in need of repair, could be compromised. ¶ Standing water can also have adverse impacts on the road base. (Karl et al., 2009; Smith et al., ¶ 2008) Overall, the increased risk of landslides, slope failures, and floods from runoff will lead to ¶ greater road repair and reconstruction needs (Karl et al., 2009). ¶ Some regions of the country will experience decreased precipitation. Where there is less ¶ precipitation, there may not be enough runoff to dilute surface salt causing steel reinforcing in ¶ concrete structures to corrode. In some regions, drought is expected to be an increasing problem.

## Hegemomy

### Roads

#### **The status quo is failing to respond to the climate issue-Leadership on the highway vulnerability is critical to spur action.**

Meyer et al. 09, (Michael Frederick R. Dickerson Professor, School of Civil and Environmental Engineering, Georgia Institute of Technology, PhD Michael Flood Senior Planner at Parsons Brinckerhoff ¶ Chris Dorney Transportation/Land Use Planner at Parsons Brinckerhoff ¶ Ken Leonard Principal of Cambridge Systematics, ¶ Robert Hyman Associate at Cambride Systematics ¶ Joel Smith expert on climate change policy, lead author of the Intergovernmental Panel on Climate Change 2001 and 2007 assessment report; the latter shared the Noble Peace Prize with former Vice President Al Gore. Vice-President of Stratus Consulting, Boulder, CO. “Climate Change and the Highway System: Impacts and Adaptation Approaches”. National Cooperative Highway Research Program. 5/6/2009 http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-83%2805%29\_Task2-3SynthesisReport.pdf)

There is a growing consensus amongst academic researchers and highway agencies that ¶ climate change is a threat to many aspects of the highway system which warrants spending ¶ resources to investigate the specific risks it poses. Still, the majority of US highway agencies ¶ remain unaware (or dismissive) of the potential threats and have yet to take any adaptation ¶ actions. ¶ x The lack of engineering relevant and spatially precise climate data and the uncertainty ¶ surrounding those data remain obstacles and will likely remain so for the foreseeable future ¶ despite the best efforts of climate modelers. This should not, however, be an excuse for ¶ inaction. Some governments, such as New York City, realize the data shortcomings issue ¶ and have put forth alternative approaches (e.g. flexible adaptation pathways) to enable ¶ prudent decision making in light of the uncertainty. ¶ x Leadership is critical. Strong national mandates to consider adaptation and provide ¶ relevant data greatly encourage adaptation activities. That said, they need not be a ¶ prerequisite. Absent mandates, strong state or local leadership by individuals concerned ¶ about climate changes can also spur action as is the case in most US examples. Visible on the-ground changes, as in Alaska, can also focus attention on the topic. ¶ x Most agencies that are concerned about adaptation begin by conducting a risk assessment ¶ of existing assets. Most of these risk assessments remain largely qualitative and based on ¶ professional judgment. This will likely remain the case until more probabilistic climate ¶ projections become available. ¶ x Both domestically and internationally, limited action has been taken on the ground thus far ¶ to build climate resiliency into the transportation system. Indeed, with some notable ¶ exceptions, much adaptation work remains at a planning or risk assessment level and has ¶ yet to be incorporated into the design of individual projects. This is likely to change in the ¶ near future as the risk assessment studies progress and the global economy picks up ¶ providing more resources for adaptation. ¶ x Some risk assessments to date have shown the highway system to have only modest ¶ vulnerabilities to climate change. Others have indicated enough cause for concern to ¶ recommend action be taken. Whether an agency chooses to take adaptation action depends ¶ on their fiscal and political capacity to effect change and their level of tolerance for risk. It is ¶ quite possible that separate agencies, facing the same risks, might choose very different ¶ courses of action, especially absent any set of national or industry standards. ¶ x Risks to the highway system due to sea level rise and increased precipitation ¶ amounts/intensity appear to be the biggest cause for concern and amongst the first ¶ priorities for action. NCHRP 20-83 (5) Task 2.3 Synthesis Report ¶ Review of Key Climate Impacts to the Highway System ¶ and Current Adaptation Practices and Methodologies ¶ 75 ¶ Future phases of this project will take note of these observations and build off of them to generate ¶ new techniques for ensuring highway system resiliency as we enter a new period of climate ¶ uncertainty.

#### **Climate change threatens road system-multiple reasons-Delaying mitigation measures magnifies the impacts**

FHWA 10’ [Federal Highway Administration, US Department of Transportation, “Regional Climate Change Effects: Useful Information for Transportation Agencies”, http://www.fhwa.dot.gov/environment/climate\_change/adaptation/resources\_and\_publications/climate\_effects/effects03.cfm]

"Climate affects the design, construction, safety, operations, and maintenance of transportation infrastructure and systems. The prospect of a changing climate raises critical questions regarding how alterations in temperature, precipitation, storm events, and other aspects of the climate could affect the nation's roads, airports, rail, transit systems, pipelines, ports, and waterways." CCSP 2008a

The changing climate poses serious challenges to the transportation community, given the community's need to watch over transportation systems and infrastructure designed to last decades or longer. Transportation functions tied to construction, operations, maintenance, and planning should be grounded in an understanding of the environment expected to support transportation facilities. Decisions therefore need to be informed by an understanding of potential future changes in climate… Why should the transportation community care about this information? The impacts of climate change can include weakened bridges and road beds, temporarily or permanently flooded roads, damaged pavements, and changes in road weather that can affect safety and economic activity. Understanding and proactively addressing the potential impacts of climate change can help avoid the potential damage, disruption in service, and safety concerns that climate change may cause.

#### This threatens military effectiveness

Cox and Love 96 (Wendell and Jean, American Highways Users Alliance, "40 Years of the US Interstate Highway System: An Analysis The Best Investment A Nation Ever Made," June, <http://www.publicpurpose.com/freeway1.htm>)

One of the principal reasons for building the interstate highway system was to support national defense. When the system was approved --- during one of the most instable periods of the Cold War, national security dictated development of an efficient national highway system that could move large numbers of military personnel and huge quantities of military equipment and supplies. The interstate highway system effectively performs that function, but perhaps more importantly, its availability provides the nation with a potential resource that could have been reliably called upon if greater military conflict had arisen. Throughout the Cold War (and even to today), America's strategic advantage in effective surface transportation was unchallenged. Even today, no constituent nation of the late Soviet Union has begun to develop such a comprehensive surface transportation system. In the post-communist world, it may be tempting to underestimate the role of the interstate highway system in national defense. But the interstate highway system continues to play a critical role. The U.S. military's Strategic Highway Corridor Network (STAHNET) relies primarily on the interstate highway network, which represents 75 percent of network mileage. The U.S. Army cited the that system as being critical to the success of the 1990-1991 "Desert Shield-Desert Storm operation (the U.S. led operation to free Kuwait from Iraq): Much of the success of the operation was due to our logistical ability to rapidly move troops to the theater. The capacity of the U.S. highway system to support the mobilization of troops and to move equipment and forces to U.S. ports of embarkation was key to successful deployment. NOTE: "Statement of Lieutenant General Kenneth R. Wykle, United States Army, Deputy Commander in Chief, United States Transportation Command before the House Committee on Transportation and Infrastructure, Surface Transportation Committee, United States House of Representatives, on the U.S. Department of Transportation's Recommended National Highway System" (Washington, DC: March 2, 1995). The Army also noted the "modal redundancy" of the highway system, which provided rapid and effective movements of a military division when difficulties with a rail line precluded the planned transport by rail. NOTE: "Statement of Lieutenant General Kenneth R. Wykle." This illustrates the fact that the interstate highway system continues to play an important role in national defense, even in the post-Cold War era.

### Airports

#### **Absent adaptation measures, climate change will impair the smooth operation of airports**

Transportation Research Board of the National Academies ’11 [Transportation Research Board, “ Adapting Transportation to the Impacts of Climate Change”, June 2011, Transportation Research Circular, E-C152, <http://www.trb.org/Publications/Blurbs/165529.aspx> AD]

**The potential** serious physical damage **to the** facilities and infrastructure of an airport **mainly result from the changes in precipitation, temperature, sea level, storm surge, and winds**. The risks include flooding, heat buckle and other forms of expansion stress, permafrost thaw buckle in northern regions, perimeter security breaches, and fuel contamination or spills from pipe ruptures. As noted in the previous section, **secondary effects of climate change may also cause new risks**, such as extreme erosion, soil depletion, wild land fires, and facility damage from new species of animals and plants. Addressing potential physical damage from future climate change can generally be done • Rebuilding, relocating, or abandoning shoreline facilities (e.g., seawalls, sewage treatment outfalls, and building and runway foundations) to accommodate expected future higher sea levels It would be unusual for these types of physical improvements to be carried out in isolation from the regular process of continuous planning, design, development, and maintenance that typically goes on at any airport. Climate change adaptation actions for the physical plant can be seen as one of many objectives to be incorporated into the master planning and asset management process. This approach ensures that solutions are thought through in an integrated and comprehensive manner, to minimize the costs of the improvements and maximize the efficiency of the development process over time. The goal is to adapt to this new consideration of climate change in a way that still maximizes the utility of the often very long lived components of the airport infrastructure.

#### Civilian airport infrastructure is vital to theater airlift and air defense capability

Department of the Air Force ’01 [Air Force, “PRESENTATION TO THE COMMITTEE ON ARMED SERVICES, SUBCOMMITTEE ON READINESS AND MANAGEMENT, UNITED STATES SENATE”, March 21, 2001, Air Force, <http://www.globalsecurity.org/military/library/congress/2001_hr/010321js.pdf> AD]

The Air National Guard is a constitutionally unique military organization with roots dating back to the very beginnings of our country and its militia. Our State and Federal missions are accomplished by 88 flying wings and 1,600 support units located at 173 locations in all 50 states, 3 territories and the District of Columbia. The plant value of Air National Guard-managed real estate exceeds $12.6 billion with over 4,800 facilities comprising in excess of 32 million square feet. We partner with 67 civilian airports that provide access to an additional $4.4 billion in airfield infrastructure at a fraction of what it would cost us to own and operate it ourselves. These facilities support a Total Force capability that is unrivaled in the world today. While comprising roughly 34 percent of the Air Force’s mission capability, the Air National Guard specifically provides 100 percent of the Nation’s air defense and 45 percent of the theater airlift mission to name a few. In addition to high visibility missions like last year’s flight to the South Pole to rescue Dr. Gerri Nielsen, the Air Guard is a significant player in the Aerospace Expeditionary Force.

### Rail

#### **Climate change increases freight cost**

Rossetti, ’02[Micheal A. Rossetti, Michael Rossetti is a Strategic Planner and Economist at the DOT Volpe Center. He has served as Executive Agent for the DOT/NSTC initiative on Enhanced Transportation Weather Services. He is member of the User Advisory Group of the US Weather Research Program, and of the OFCM Joint Action Group on Weather Information for Surface Transportation. He is the author of many DOT publications on transportation statistics, and technology development. Previously, he was employed at the Federal Communications Commission and National Research Council. Mr. Rossetti holds a M.A. degree from the Pennsylvania State University and an A.B. from Boston College, “The Potential Impacts of Climate Change on Transportation”, 2002, http://climate.dot.gov/documents/workshop1002/rossetti.pdf]

Climate models suggest a future warming of 0.2 - 0.3oC per decade.1 Sea levels are expected to rise at a rate of 4 to 10 cm per decade. Ancillary effects include changes in regional distributions of rainfall and soil moisture, and possibly more frequent and more intense storm systems. In recent years, the complexities of climate change and predictions of climate model outputs have introduced an additional measure of uncertainty for railroad operators. Weather events, climate oscillations, and climate trends hence affect railroad safety, including fatalities, injuries, and property damage. Through their interactions with maintenance, planning, operating efficiency, scheduling, and demand for freight and passenger services, weather and climate may also affect a firm’s balance sheet, and cash flow, capital investment decisions, and even competitive stance within the industry.

#### **Increased freight cost uniquely impact the steel industry**

Cooney, ‘07[Stephen Cooney, Congressional Research Service; Resources, Science, and Industry Division at IRL School at Cornell University, “Steel: Price and Policy Issues”, 10-31-2007, <http://digitalcommons.ilr.cornell.edu/cgi/viewcontent.cgi?article=1492&context=key_workplace>]

Rail transportation costs, seen as railways have consolidated and¶ created more “capitive shippers,” have had a negative effect on industry, particularly¶ in raising the costs and reducing the options for shipping inputs like scrap and¶ delivering finished product to customers. According to the Government¶ Accountability Office (GAO), while rail rates have declined over the long term, they¶ increased by 9% in 2005, basically for all products across the board.90 The steel¶ industry specifically reported increases of around a third in rail costs since 2003, and¶ in some cases as high as 60%. “Transportation costs have escalated to the point that¶ they now account for 15-20% of the total cost of producing steel.”91

#### Stable supply of steel key to military infrastructure

TNS, 7-1-2008[Targeted News Service, “U.S. Steel Industry Critical To Keeping Us Free,” 7-1-2008, <http://www.lexisnexis.com.turing.library.northwestern.edu/hottopics/lnacademic/>]

As we reflect on our country's independence this Fourth of July, we should pause to recognize those who fought for our freedom more than 230 years ago. But we should also recognize those who continue to keep our country free today: the men and women in uniform who offer their noble service in order to preserve America's national security.¶ "Members of the United States Navy, Marine Corps, Army, Air Force and Coast Guard, both at home and overseas, risk their lives everyday to ensure that Americans continue to have the freedoms that our country is founded upon. It is their commitment to our country that has made America what it is today - a beacon for freedom and democracy, "Andrew G. Sharkey, III, president and CEO, American Iron and Steel Institute (AISI), said. "Our veterans represent the very best of America and the U.S. steel industry is continuously working to serve the military in their efforts to defend our nation."¶ ¶ Sharkey said domestically-produced steel is important to "improve our military platforms, strengthen the nation's industrial base and harden our vital homeland security infrastructure."¶ Congressman Peter J. Visclosky (D-IN), Chairman of the Congressional Steel Caucus, has noted that "to ensure that our national defense needs will be met, it is crucial that we have a robust and vibrant domestic steel industry. It is poor policy to rely on foreign steel for our national security - instead, we need a long-term investment in domestically-produced, high-quality and reliable steel that will serve and strengthen our national security interests."¶ Protecting the nation's vast infrastructure is essential to our homeland security. This became an issue in recent times when it was discovered that substandard steel imported from China was being used by the U.S. Department of Homeland Security to construct the border fence between the United States and Mexico. Members of the Congressional Steel Caucus, including Congressman Visclosky (D-IN), have worked to introduce legislation that will help strengthen the domestic steel industry in order to address issues of substandard steel imports.¶ "AISI and its members greatly appreciate the Congressional Steel Caucus' support for the steel industry and their vigilance on behalf of America's national security," Sharkey said.¶ In addition, thousands of skilled men and women of the U.S. steel industry work to produce high quality, cost-competitive products that are used by the military in various applications ranging from aircraft carriers and nuclear submarines to Patriot and Stinger missiles, Sharkey said. Land based vehicles, such as the Bradley Fighting Vehicle, Abrams Tank and the family of Light Armored Vehicles, also utilize significant tonnage of steel plate per vehicle. The up-armored Humvee, in use by the U.S. Army, includes steel plating around the cab of the vehicle, offering improved protection against small arms fire and shrapnel. In fact, the steel plating underneath the cab is designed to survive up to eight pounds of explosives beneath the engine to four pounds in the cargo area. These critical applications require consistent, high quality domestic sources of supply.¶ "We as a country need to make sure that our national defense needs will be met, making it critical for the United States to have a robust and vibrant domestic steel industry that will serve to strengthen our national security interests," Sharkey noted.¶ Historically, American-made steel and specialty metals have been integral components of U.S. military strength and they continue in this role today. The Department of Defense's (DOD's) primary use of steel in weapons systems is for shipbuilding, but steel is also an important component in ammunition, aircraft parts, and aircraft engines. DOD's steel requirements are satisfied by both integrated steel mills and EAF producer mills.¶ "With the desire never to be dependent on foreign nations for the steel used in military applications, it is critical that U.S. trade laws be defended, strengthened and enforced so that American-made steel can continue to play a vital role in our nation's security," Sharkey said. "On this Independence Day, let's pledge to work to uphold that ideal."

### Impact

#### US primacy is key to solve great power wars

Zhand & Shi 11 - \*Yuhan, a researcher at the Carnegie Endowment for International Peace, Washington, D.C. \*\*\* AND\*\*\* Lin, Columbia University. She also serves as an independent consultant for the Eurasia Group and a consultant for the World Bank in Washington, D.C. “America’s decline: A harbinger of conflict and rivalry” <http://www.eastasiaforum.org/2011/01/22/americas-decline-a-harbinger-of-conflict-and-rivalry/>)

Over the past two decades, no other state has had the ability to seriously challenge the US military. Under these circumstances, motivated by both opportunity and fear, many actors have bandwagoned with US hegemony and accepted a subordinate role. Canada, most of Western Europe, India, Japan, South Korea, Australia, Singapore and the Philippines have all joined the US, creating a status quo that has tended to mute great power conflicts.

However, as the hegemony that drew these powers together withers, so will the pulling power behind the US alliance. The result will be an international order where power is more diffuse, American interests and influence can be more readily challenged, and conflicts or wars may be harder to avoid.

As history attests, power decline and redistribution result in military confrontation. For example, in the late 19th century America’s emergence as a regional power saw it launch its first overseas war of conquest towards Spain. By the turn of the 20th century, accompanying the increase in US power and waning of British power, the American Navy had begun to challenge the notion that Britain ‘rules the waves.’ Such a notion would eventually see the US attain the status of sole guardians of the Western Hemisphere’s security to become the order-creating Leviathan shaping the international system with democracy and rule of law.

Defining this US-centred system are three key characteristics: enforcement of property rights, constraints on the actions of powerful individuals and groups and some degree of equal opportunities for broad segments of society. As a result of such political stability, free markets, liberal trade and flexible financial mechanisms have appeared. And, with this, many countries have sought opportunities to enter this system, proliferating stable and cooperative relations.

However, what will happen to these advances as America’s influence declines? Given that America’s authority, although sullied at times, has benefited people across much of Latin America, Central and Eastern Europe, the Balkans, as well as parts of Africa and, quite extensively, Asia, the answer to this question could affect global society in a profoundly detrimental way.

Public imagination and academia have anticipated that a post-hegemonic world would return to the problems of the 1930s: regional blocs, trade conflicts and strategic rivalry. Furthermore, multilateral institutions such as the IMF, the World Bank or the WTO might give way to regional organisations.

For example, Europe and East Asia would each step forward to fill the vacuum left by Washington’s withering leadership to pursue their own visions of regional political and economic orders. Free markets would become more politicised — and, well, less free — and major powers would compete for supremacy.

Additionally, such power plays have historically possessed a zero-sum element. In the late 1960s and 1970s, US economic power declined relative to the rise of the Japanese and Western European economies, with the US dollar also becoming less attractive. And, as American power eroded, so did international regimes (such as the Bretton Woods System in 1973).

A world without American hegemony is one where great power wars re-emerge, the liberal international system is supplanted by an authoritarian one, and trade protectionism devolves into restrictive, anti-globalisation barriers. This, at least, is one possibility we can forecast in a future that will inevitably be devoid of unrivalled US primacy.

## Economy

#### **Current recovery is fragile-long-term growth is uncertain**

The Guardian 6/26 (Ewen MacAskill and Dominic Rushe, “OECD Says US economy recovery but income equality problematic” June 26th, 2012, http://www.guardian.co.uk/business/2012/jun/26/oecd-us-economy-income-inequality)

The OECD report said that growth in the US will remain moderate this year but concludes that America's economic recovery has "gained momentum".¶ Consumer and business spending have risen and unemployment, though still high at 8.2%, has fallen nearly two percentage points from its peak in 2009.¶ "Even with these substantial improvements, however, the recovery is far from complete," the OECD warns. The US housing market has picked up but the large overhang of unsold homes and "the ongoing tide of foreclosures will continue to put downward pressure on house prices," according to the report.¶ Europe's economic crisis and the looming political fight over the expiration on 31 December expiration of Bush-era tax cuts and imposition of automatic spending cuts – also remain serious threats, the report warns.¶ It called on Congress to seek to trim government spending gradually rather than make drastic cuts at the end of this year, the so-called 'fiscal cliff' when $1.2tn in automatic spending cuts are due to kick in.¶ The slow pace of recovery in construction, normally an important source of growth following recessions, is also a worry, said the OECD. In addition, "uncertainty about the sustainability of the recovery has restrained business investment and slow growth in some trading partners has held back exports."¶

#### Climate change will unravel current transportation infrastructure networks-This will wreck the economy

Joanne R. Potter et al, March 2008, Michael J. Savonis, Virginia R. Burkett U.S. Climate Change Science Program Synthesis and Assessment Product 4.7 “Impacts of Climate Change and Variability on Transportation Systems and Infrastructure: Gulf Coast Study, Phase I” <http://files.library.northwestern.edu.turing.library.northwestern.edu/transportation/online/restricted/200819/PB2008110533.pdf>

Transportation is such an integral part of daily life in the United States that few pause to consider its importance. Yet the Nation’s strong intermodal network of highways, public transit, rail, marine, and aviation is central to our ability to work, go to school, enjoy leisure time, maintain our homes, and stay in touch with friends and family. U.S. businesses depend on reliable transportation services to receive materials and transport products to their customers; a robust transportation network is essential to the economy. In short, a sound transportation system is vital to the Nation’s social and economic future. Transportation professionals – including planners, designers, engineers, financial specialists, ecologists, safety experts, and others – work hard to ensure that U.S. communities have access to safe and dependable transportation services. Given the ongoing importance of the Nation’s transportation system, it is appropriate to consider what effect climate change may have on this essential network. Through a regional case study of the central Gulf Coast, this report begins to examine the potential implications of climate change on transportation infrastructure, operations, and services. Investments in transportation are substantial and result in infrastructure that lasts for decades. Transportation plans and designs should, therefore, be carefully considered and well informed by a range of factors, including consideration of climate variability and change. Climate also affects the safety, operations, and maintenance of transportation infrastructure and systems. This research investigates the potential impacts of climate variability and change on transportation, and it assesses how planners and managers may incorporate this information into their decisions to ensure a reliable and robust future transportation network. This report does not contain recommendations about specific facilities or adaptation strategies, but rather seeks to contribute to the information available so that States and local communities can make more informed decisions when planning for the future.

The climate models used to estimate temperature changes agree that it will be warmer in the future. According to the IPCC report, global average warming is expected to be about 0.4°C (0.72°F) during the next 20 years. Even if the concentrations of all greenhouse gases and aerosols had been stabilized at 2000 levels, warming of 0.2°C (0.36°F) would be expected during this period (IPCC, 2007). Over the longer term, the IPCC models project average global temperature increases ranging from 1.1°C (1.98°F) to 6.4°C (11.5°F) by the end of the 21st century, although climate responses in specific regions will vary. These projections are the result of reviewing a robust set of global climate models under a variety of future scenarios – using a range of assumptions for future economic activity and energy use – for the Earth as a whole. The average increase in temperature may not be as important to the transportation community as the changes in extreme temperature, which also are expected to increase. Over the last 50 years, the frequency of cold days and nights has declined, while hot days, hot nights, and heat waves have become more frequent. The number of days with temperature above 32°C (90°F) and 38°C (100°F) has been increasing since 1970, as has the intensity and length of periods of drought. The IPCC report finds that it is virtually certain that the next century will witness warmer and more frequent hot days and nights over most land areas (IPCC, 2007). Increasing temperatures have the potential to affect multiple modes of transportation, primarily impacting surface transportation. The transportation impacts mentioned most often in the literature included pavement damage; rail buckling; less lift and fuel efficiency for aircraft; and the implications of lower inland water levels, thawing permafrost, reduced ice cover on seaways, and an increase in vegetation. These are discussed in greater detail below:

• Pavement damage – The quality of highway pavement was identified as a potential issue for temperate climates, where more extreme summer temperatures and/or more frequent freeze/thaw cycles may be experienced. Extremely hot days, over an extended period of time, could lead to the rutting of highway pavement and the more rapid breakdown of asphalt seal binders, resulting in cracking, potholing, and bleeding. This, in turn, could damage the structural integrity of the road and/or cause the pavement to become more slippery when wet. Adaptation measures mentioned included more frequent maintenance, milling out ruts, and the laying of more heat resistant asphalt.

• Rail buckling – Railroads could encounter rail buckling more frequently in temperate climates that experience extremely hot temperatures. If unnoticed, rail buckling can result in derailment of trains. Peterson (2008) noted, “Lower speeds and shorter trains, to shorten braking distance, and lighter loads to reduce track stress are operational impacts.” Adaptation measures included better monitoring of rail temperatures and ultimately more maintenance of the track, replacing it when needed.

• Vegetation growth – The growing season for deciduous trees that shed their leaves may be extended, causing more slipperiness on railroads and roads and visual obstructions. Possible adaptation measures included better management of the leaf foliage and planting more low-maintenance vegetation along transportation corridors to act as buffers (Wooler, 2004).

• Reductions in aircraft lift and efficiency – Higher temperatures would reduce air density, decreasing both lift and the engine efficiency of aircraft. As a result, longer runways and/or more powerful airplanes would be required. However, one analyst projected that technical advances would minimize the need for runway redesign as aircraft become more powerful and efficient (Wooler, 2004).

• Reduced water levels – Changes in water levels were discussed in relation to marine transport. Inland waterways such as the Great Lakes and Mississippi River could experience lower water levels due to increased temperatures and evaporation; these lower water levels would mean that ships and barges would not be able to carry as much weight. Adaptation measures included reducing cargo loads, designing vessels to require less draft, or dredging the water body to make it deeper.

• Reduced ice cover – Reduced ice cover was generally considered a positive impact of increasing temperatures in the literature. For example, a study conducted by John D. Lindeberg and George M. Albercook, which was included in the Report of the Great Lakes Regional Assessment Group for the U.S. Global Change Research Program, stated, “the costs of additional dredging [due to lower water levels] could be partially mitigated by the benefits of additional shipping days on the [Great] Lakes caused by less persistent ice cover” (Sousounis, 2000, p. 41). Additionally, arctic sea passages could open; for example, the Arctic Climate Impact Assessment noted, “projected reductions in sea-ice extent are likely to improve access along the Northern Sea Route and the Northwest Passage” (Instanes et al., 2005, p. 934). However, negative environmental and security impacts also may result from reduced ice cover as well from as the increased level of shipping. These are discussed below in the subsection on indirect impacts (Section 1.3.6.).

• Thawing permafrost – The implications of thawing permafrost for Arctic infrastructure receive considerable attention in the literature. Permafrost is the foundation upon which much of the Arctic’s infrastructure is built. The literature consistently noted that as the permafrost thaws the infrastructure will become unstable – an effect being experienced today. Roads, railways, and airstrips are all vulnerable to the thawing of permafrost. Adaptation measures vary depending on the amount of permafrost that underlies any given piece of infrastructure. The literature suggested that some assets will only need rehabilitation, other assets will need to be relocated, and different construction methods will need to be used, including the possibility of installing cooling mechanisms. According to the Arctic Research Commission, “roads, railways, and airstrips placed on ice-rich continuous permafrost will generally require relocation to well-drained natural foundations or replacement with substantially different construction methods” (U.S. Arctic Research Commission Permafrost Task Force, 2003, p. 29).

• Other – Other impacts of increasing temperatures included a reduction in ice loads on structures (such as bridges and piers), which could eventually allow them to be designed for less stress, and a lengthening of construction seasons due to fewer colder days in traditionally cold climates.

#### **Proactive measures now are critical to avert structural economic decline**

Winkleman et al, ’12 [Steve Winkleman, Jan Muller, Erica Jue, associated with the CCAP and EESI, “CLIMATE ADAPTATION & TRANSPORTATION Identifying Information and Assistance Needs”, http://files.eesi.org/Climate\_Adaptation\_Transportation.pdf]

Extreme weather events, including coastal storm surges, flooding, heating and freezing, and severe rain, snow, ice, and wind events, as well as changing average conditions and seasonal weather patterns – including, sea level rise, precipitation totals, mean temperatures, evapotranspiration rates, and ecosystem changes, are projected to affect safety, cost-effectiveness, efficiency, and technical feasibility of transportation investment and asset management decisions. These impacts will vary from region to region and may even vary at the local and site scale. Anticipating the consequences of such disruptive changes and planning prudent responses before they become reality will help transportation agencies protect the transportation infrastructure upon which communities, regions, and the national economy depend for the movement of goods and people.

The general nature of potential climate change impacts on transportation has been reasonably well-defined. The specific operational implications for transportation agencies and the broader transportation community, however, are not well understood.

#### That causes global war

ROYAL ‘10 – Director of Cooperative Threat Reduction at the U.S. Department of Defense (Jedediah, “Economic Integration, Economic Signaling and the Problem of Economic Crises,” in Economics of War and Peace: Economic, Legal and Political Perspectives, ed. Goldsmith and Brauer, p. 213-215)

Less intuitive is how periods of economic decline may increase the likelihood of external conflict. Political science literature has contributed a moderate degree of attention to the impact of economic decline and the security and defence behaviour of interdependent states. Research in this vein has been considered at systemic, dyadic and national levels. Several notable contributions follow. First, on the systemic level, Pollins (2008) advances Modelski and Thompson's (1996) work on leadership cycle theory, finding that rhythms in the global economy are associated with the rise and fall of a pre-eminent power and the often bloody transition from one pre-eminent leader to the next. As such, exogenous shocks such as economic crises could usher in a redistribution of relative power (see also Gilpin. 1981) that leads to uncertainty about power balances, increasing the risk of miscalculation (Feaver, 1995). Alternatively, even a relatively certain redistribution of power could lead to a permissive environment for conflict as a rising power may seek to challenge a declining power (Werner. 1999). Separately, Pollins (1996) also shows that global economic cycles combined with parallel leadership cycles impact the likelihood of conflict among major, medium and small powers, although he suggests that the causes and connections between global economic conditions and security conditions remain unknown. Second, on a dyadic level, Copeland's (1996, 2000) theory of trade expectations suggests that 'future expectation of trade' is a significant variable in understanding economic conditions and security behaviour of states. He argues that interdependent states are likely to gain pacific benefits from trade so long as they have an optimistic view of future trade relations. However, if the expectations of future trade decline, particularly for difficult to replace items such as energy resources, the likelihood for conflict increases, as states will be inclined to use force to gain access to those resources. Crises could potentially be the trigger for decreased trade expectations either on its own or because it triggers protectionist moves by interdependent states.4 Third, others have considered the link between economic decline and external armed conflict at a national level. Blomberg and Hess (2002) find a strong correlation between internal conflict and external conflict, particularly during periods of economic downturn. They write: The linkages between internal and external conflict and prosperity are strong and mutually reinforcing. Economic conflict tends to spawn internal conflict, which in turn returns the favour. Moreover, the presence of a recession tends to amplify the extent to which international and external conflicts self-reinforce each other. (Blomberg & Hess, 2002. p. 89) Economic decline has also been linked with an increase in the likelihood of terrorism (Blomberg, Hess, & Weerapana, 2004), which has the capacity to spill across borders and lead to external tensions. Furthermore, crises generally reduce the popularity of a sitting government. “Diversionary theory" suggests that, when facing unpopularity arising from economic decline, sitting governments have increased incentives to fabricate external military conflicts to create a 'rally around the flag' effect. Wang (1996), DeRouen (1995). and Blomberg, Hess, and Thacker (2006) find supporting evidence showing that economic decline and use of force are at least indirectly correlated. Gelpi (1997), Miller (1999), and Kisangani and Pickering (2009) suggest that the tendency towards diversionary tactics are greater for democratic states than autocratic states, due to the fact that democratic leaders are generally more susceptible to being removed from office due to lack of domestic support. DeRouen (2000) has provided evidence showing that periods of weak economic performance in the United States, and thus weak Presidential popularity, are statistically linked to an increase in the use of force. In summary, recent economic scholarship positively correlates economic integration with an increase in the frequency of economic crises, whereas political science scholarship links economic decline with external conflict at systemic, dyadic and national levels.5 This implied connection between integration, crises and armed conflict has not featured prominently in the economic-security debate and deserves more attention. This observation is not contradictory to other perspectives that link economic interdependence with a decrease in the likelihood of external conflict, such as those mentioned in the first paragraph of this chapter. Those studies tend to focus on dyadic interdependence instead of global interdependence and do not specifically consider the occurrence of and conditions created by economic crises. As such, the view presented here should be considered ancillary to those views.

## Trade

#### **Even small changes in climate will have serious implications for the transportation sector and global trade**

World Trade Organization and United Nations Environment Programme ’09 [WTO and UNEP, “Trade and Climate Change”, 2009, WTO and UNEP, <http://www.wto.org/english/res_e/booksp_e/trade_climate_change_e.pdf>, AD]

As greenhouse gas emissions and temperatures increase, the impacts from climate change are expected to become more widespread and to intensify. For example, even with small increases in average temperature, the type, frequency and intensity of extreme weather – such as hurricanes, typhoons, fl oods, droughts, and storms – are projected to increase. Th e distribution of these weather events, however, is expected to vary considerably among regions and countries, and impacts will depend to a large extent on the vulnerability of populations or ecosystems. Developing countries, and particularly the poorest and most marginalized populations within these countries, will generally be both the most adversely aff ected by the impacts of future climate change and the most vulnerable to its eff ects, because they are less able to adapt than developed countries and populations. In addition, climate change risks compound the other challenges which are already faced by these countries, including tackling poverty, improving health care, increasing food security and improving access to sources of energy. For instance, climate change is projected to lead to hundreds of millions of people having limited access to water supplies or facing inadequate water quality, which will, in turn, lead to greater health problems. Although the impacts of climate change are specifi c to location and to the level of development, most sectors of the global economy are expected to be affected and these impacts will often have implications for trade. For example, three trade-related areas are considered to be particularly vulnerable to climate change. Agriculture is considered to be one of the sectors most vulnerable to climate change, and also represents a key sector for international trade. In low-latitude regions, where most developing countries are located, reductions of about 5 to 10 per cent in the yields of major cereal crops are projected even in the case of small temperature increases of around 1° C. Although it is expected that local temperature increases of between 1° C and 3° C would have benefi cial impacts on agricultural outputs in mid- to high-latitude regions, warming beyond this range will most likely result in increasingly negative impacts for these regions also. According to some studies, crop yields in some African countries could fall by up to 50 per cent by 2020, with net revenues from crops falling by as much as 90 per cent by 2100. Depending on the location, agriculture will also be prone to water scarcity due to loss of glacial meltwater and reduced rainfall or droughts. Tourism is another industry that may be particularly vulnerable to climate change, for example, through changes in snow cover, coastal degradation and extreme weather. Both the fi sheries and forestry sectors also risk being adversely impacted by climate change. Likewise, ix Part IV Part III Part II Part I there are expected to be major impacts on coastal ecosystems, including the disappearance of coral and the loss of marine biodiversity. Finally, one of the clearest impacts will be on trade infrastructure and routes. The IPCC has identified port facilities, as well as buildings, roads, railways, airports and bridges, as being dangerously at risk of damage from rising sea levels and the increased occurrence of instances of extreme weather, such as fl ooding and hurricanes. Moreover, it is projected that changes in sea ice, particularly in the Arctic, will lead to the availability of new shipping routes.

#### **Federal investment in transportation infrastructure is critical to trade**

FHA 02 (Federal Highway Administration, part of the US Department of Transportation “2002 Status of the Nation's Highways, Bridges, and Transit: Conditions & Performance” 11/24/02. http://www.fhwa.dot.gov/policy/2002cpr/pdf/ch12.pdf)

America’s transportation system is the essential element facilitating the movement of goods and people within¶ the country. It forms the backbone of local, regional, national, and international trade, making most economic¶ activity critically dependent upon this resource. The Nation’s urban transportation systems have enabled the¶ growth of America’s cities, linking workers with employers, wholesalers with retailers, markets with buyers,¶ and residents with recreational and cultural facilities. The intercity transportation system helps bring America’s¶ cities, States, and regions together, linking farmers and manufacturers to markets, raw material suppliers to¶ processors, businesses to clients, and tourists to destinations.¶ These transportation functions are served by a wide variety of modes. Airways and airports provide rapid,¶ long-distance transportation services for travelers, mail, and freight. On the surface, freight moves by water,¶ rail, highways, and pipelines, while people move by passenger rail, buses, ferries, and private vehicles.¶ The surface transportation system serving the United States today reflects investment and location decisions¶ made by both governments and private enterprise since the beginning of the Nation. Early settlement and¶ transportation patterns were determined primarily by geography, with waterborne and horse-drawn¶ transportation the dominant modes. Over the years, improvements in vehicle technology, including¶ steamships, locomotives, automobiles, and airplanes, have greatly expanded both the speed and flexibility of¶ transportation movements, allowing economic activity to concentrate in cities and spread across the country.¶ Harnessing the potential of these technologies has required large investments in guideways and facilities,¶ including ports and canals, railroads and terminals, highways and bridges, and airports and airways. The¶ development of these facilities has also been greatly aided by advancements in bridge, tunnel, pavement,¶ building, and communications technologies.¶ The Federal government has played a key role throughout the country’s history in shaping the transportation¶ system, both in regulating interstate commerce and in funding and facilitating transportation improvements.¶ Examples of the latter include the construction of the National Road in the early 19¶ th¶ Century; the Pacific¶ Railroad Act of 1862; inland waterways built by the Army Corps of Engineers; the Federal-Aid Highway¶ Program and the Interstate Highway System of the 20¶ th¶ Century; and Federal assistance for mass transit¶ operators beginning in the 1960’s

#### US Trade leadership is critical to multilateral trade – which solves all global problems

Panitchpakdi ‘4 (Supachai Panitchpakdi, secretary-general of the UN Conference on Trade and Development, 2/26/2004, American Leadership and the World Trade Organization, p. http://www.wto.org/english/news\_e/spsp\_e/spsp22\_e.htm

The second point is that strengthening the world trading system is essential to America's wider global objectives. Fighting terrorism, reducing poverty, improving health, integrating China and other countries in the global economy — all of these issues are linked, in one way or another, to world trade. This is not to say that trade is the answer to all America's economic concerns; only that meaningful solutions are inconceivable without it. The world trading system is the linchpin of today's global order — underpinning its security as well as its prosperity. A successful WTO is an example of how multilateralism can work. Conversely, if it weakens or fails, much else could fail with it. This is something which the US — at the epicentre of a more interdependent world — cannot afford to ignore. These priorities must continue to guide US policy — as they have done since the Second World War. America has been the main driving force behind eight rounds of multilateral trade negotiations, including the successful conclusion of the Uruguay Round and the creation of the WTO. The US — together with the EU — was instrumental in launching the latest Doha Round two years ago. Likewise, the recent initiative, spearheaded by Ambassador Zoellick, to re-energize the negotiations and move them towards a successful conclusion is yet another example of how essential the US is to the multilateral process — signalling that the US remains committed to further liberalization, that the Round is moving, and that other countries have a tangible reason to get on board. The reality is this: when the US leads the system can move forward; when it withdraws, the system drifts. The fact that US leadership is essential, does not mean it is easy. As WTO rules have expanded, so too has as the complexity of the issues the WTO deals with — everything from agriculture and accounting, to tariffs and telecommunication. The WTO is also exerting huge gravitational pull on countries to join — and participate actively — in the system. The WTO now has 146 Members — up from just 23 in 1947 — and this could easily rise to 170 or more within a decade. Emerging powers like China, Brazil, and India rightly demand a greater say in an institution in which they have a growing stake. So too do a rising number of voices outside the system as well. More and more people recognize that the WTO matters. More non-state actors — businesses, unions, environmentalists, development NGOs — want the multilateral system to reflect their causes and concerns. A decade ago, few people had even heard of the GATT. Today the WTO is front page news. A more visible WTO has inevitably become a more politicized WTO. The sound and fury surrounding the WTO's recent Ministerial Meeting in Cancun — let alone Seattle — underline how challenging managing the WTO can be. But these challenges can be exaggerated. They exist precisely because so many countries have embraced a common vision. Countries the world over have turned to open trade — and a rules-based system — as the key to their growth and development. They agreed to the Doha Round because they believed their interests lay in freer trade, stronger rules, a more effective WTO. Even in Cancun the great debate was whether the multilateral trading system was moving fast and far enough — not whether it should be rolled back. Indeed, it is critically important that we draw the right conclusions from Cancun — which are only now becoming clearer. The disappointment was that ministers were unable to reach agreement. The achievement was that they exposed the risks of failure, highlighted the need for North-South collaboration, and — after a period of introspection — acknowledged the inescapable logic of negotiation. Cancun showed that, if the challenges have increased, it is because the stakes are higher. The bigger challenge to American leadership comes from inside — not outside — the United States. In America's current debate about trade, jobs and globalization we have heard a lot about the costs of liberalization. We need to hear more about the opportunities. We need to be reminded of the advantages of America's openness and its trade with the world — about the economic growth tied to exports; the inflation-fighting role of imports, the innovative stimulus of global competition. We need to explain that freer trade works precisely because it involves positive change — better products, better job opportunities, better ways of doing things, better standards of living. While it is true that change can be threatening for people and societies, it is equally true that the vulnerable are not helped by resisting change — by putting up barriers and shutting out competition. They are helped by training, education, new and better opportunities that — with the right support policies — can flow from a globalized economy. The fact is that for every job in the US threatened by imports there is a growing number of high-paid, high skill jobs created by exports. Exports supported 7 million workers a decade ago; that number is approaching around 12 million today. And these new jobs — in aerospace, finance, information technology — pay 10 per cent more than the average American wage. We especially need to inject some clarity — and facts — into the current debate over the outsourcing of services jobs. Over the next decade, the US is projected to create an average of more than 2 million new services jobs a year — compared to roughly 200,000 services jobs that will be outsourced. I am well aware that this issue is the source of much anxiety in America today. Many Americans worry about the potential job losses that might arise from foreign competition in services sectors. But it’s worth remembering that concerns about the impact of foreign competition are not new. Many of the reservations people are expressing today are echoes of what we heard in the 1970s and 1980s. But people at that time didn’t fully appreciate the power of American ingenuity. Remarkable advances in technology and productivity laid the foundation for unprecedented job creation in the 1990s and there is no reason to doubt that this country, which has shown time and again such remarkable potential for competing in the global economy, will not soon embark again on such a burst of job-creation. America's openness to service-sector trade — combined with the high skills of its workforce — will lead to more growth, stronger industries, and a shift towards higher value-added, higher-paying employment. Conversely, closing the door to service trade is a strategy for killing jobs, not saving them. Americans have never run from a challenge and have never been defeatist in the face of strong competition. Part of this challenge is to create the conditions for global growth and job creation here and around the world. I believe Americans realize what is at stake. The process of opening to global trade can be disruptive, but they recognize that the US economy cannot grow and prosper any other way. They recognize the importance of finding global solutions to shared global problems. Besides, what is the alternative to the WTO? Some argue that the world's only superpower need not be tied down by the constraints of the multilateral system. They claim that US sovereignty is compromised by international rules, and that multilateral institutions limit rather than expand US influence. Americans should be deeply sceptical about these claims. Almost none of the trade issues facing the US today are any easier to solve unilaterally, bilaterally or regionally. The reality is probably just the opposite. What sense does it make — for example — to negotiate e-commerce rules bilaterally? Who would be interested in disciplining agricultural subsidies in a regional agreement but not globally? How can bilateral deals — even dozens of them — come close to matching the economic impact of agreeing to global free trade among 146 countries? Bilateral and regional deals can sometimes be a complement to the multilateral system, but they can never be a substitute. There is a bigger danger. By treating some countries preferentially, bilateral and regional deals exclude others — fragmenting global trade and distorting the world economy. Instead of liberalizing trade — and widening growth — they carve it up. Worse, they have a domino effect: bilateral deals inevitably beget more bilateral deals, as countries left outside are forced to seek their own preferential arrangements, or risk further marginalization. This is precisely what we see happening today. There are already over two hundred bilateral and regional agreements in existence, and each month we hear of a new or expanded deal. There is a basic contradiction in the assumption that bilateral approaches serve to strengthen the multilateral, rules-based system. Even when intended to spur free trade, they can ultimately risk undermining it. This is in no one's interest, least of all the United States. America led in the creation of the multilateral system after 1945 precisely to avoid a return to hostile blocs — blocs that had done so much to fuel interwar instability and conflict. America's vision, in the words of Cordell Hull, was that “enduring peace and the welfare of nations was indissolubly connected with the friendliness, fairness and freedom of world trade”. Trade would bind nations together, making another war unthinkable. Non-discriminatory rules would prevent a return to preferential deals and closed alliances. A network of multilateral initiatives and organizations — the Marshal Plan, the IMF, the World Bank, and the GATT, now the WTO — would provide the institutional bedrock for the international rule of law, not power. Underpinning all this was the idea that freedom — free trade, free democracies, the free exchange of ideas — was essential to peace and prosperity, a more just world. It is a vision that has emerged pre-eminent a half century later. Trade has expanded twenty-fold since 1950. Millions in Asia, Latin America, and Africa are being lifted out of poverty, and millions more have new hope for the future. All the great powers — the US, Europe, Japan, India, China and soon Russia — are part of a rules-based multilateral trading system, greatly increasing the chances for world prosperity and peace. There is a growing realization that — in our interdependent world — sovereignty is constrained, not by multilateral rules, but by the absence of rules.

#### Nuclear war

Panzner 8 – faculty at the New York Institute of Finance, 25-year veteran of the global stock, bond, and currency markets who has worked in New York and London for HSBC, Soros Funds, ABN Amro, Dresdner Bank, and JPMorgan Chase (Michael, “Financial Armageddon: Protect Your Future from Economic Collapse,” p. 136-138)

Continuing calls for curbs on the flow of finance and trade will inspire the United States and other nations to spew forth protectionist legislation like the notorious Smoot-Hawley bill. Introduced at the start of the Great Depression, it triggered a series of tit-for-tat economic responses, which many commentators believe helped turn a serious economic downturn into a prolonged and devastating global disaster. But if history is any guide, those lessons will have been long forgotten during the next collapse. Eventually, fed by a mood of desperation and growing public anger, restrictions on trade, finance, investment, and immigration will almost certainly intensify. Authorities and ordinary citizens will likely scrutinize the cross-border movement of Americans and outsiders alike, and lawmakers may even call for a general crackdown on nonessential travel. Meanwhile, many nations will make transporting or sending funds to other countries exceedingly difficult. As desperate officials try to limit the fallout from decades of ill-conceived, corrupt, and reckless policies, they will introduce controls on foreign exchange. Foreign individuals and companies seeking to acquire certain American infrastructure assets, or trying to buy property and other assets on the cheap thanks to a rapidly depreciating dollar, will be stymied by limits on investment by noncitizens. Those efforts will cause spasms to ripple across economies and markets, disrupting global payment, settlement, and clearing mechanisms. All of this will, of course, continue to undermine business confidence and consumer spending. In a world of lockouts and lockdowns, any link that transmits systemic financial pressures across markets through arbitrage or portfolio-based risk management, or that allows diseases to be easily spread from one country to the next by tourists and wildlife, or that otherwise facilitates unwelcome exchanges of any kind will be viewed with suspicion and dealt with accordingly. The rise in isolationism and protectionism will bring about ever more heated arguments and dangerous confrontations over shared sources of oil, gas, and other key commodities as well as factors of production that must, out of necessity, be acquired from less-than-friendly nations. Whether involving raw materials used in strategic industries or basic necessities such as food, water, and energy, efforts to secure adequate supplies will take increasing precedence in a world where demand seems constantly out of kilter with supply. Disputes over the misuse, overuse, and pollution of the environment and natural resources will become more commonplace. Around the world, such tensions will give rise to full-scale military encounters, often with minimal provocation. In some instances, economic conditions will serve as a convenient pretext for conflicts that stem from cultural and religious differences. Alternatively, nations may look to divert attention away from domestic problems by channeling frustration and populist sentiment toward other countries and cultures. Enabled by cheap technology and the waning threat of American retribution, terrorist groups will likely boost the frequency and scale of their horrifying attacks, bringing the threat of random violence to a whole new level. Turbulent conditions will encourage aggressive saber rattling and interdictions by rogue nations running amok. Age-old clashes will also take on a new, more heated sense of urgency. China will likely assume an increasingly belligerent posture toward Taiwan, while Iran may embark on overt colonization of its neighbors in the Mideast. Israel, for its part, may look to draw a dwindling list of allies from around the world into a growing number of conflicts. Some observers, like John Mearsheimer, a political scientist at the University of Chicago, have even speculated that an “intense confrontation” between the United States and China is “inevitable” at some point. More than a few disputes will turn out to be almost wholly ideological. Growing cultural and religious differences will be transformed from wars of words to battles soaked in blood. Long-simmering resentments could also degenerate quickly, spurring the basest of human instincts and triggering genocidal acts. Terrorists employing biological or nuclear weapons will vie with conventional forces using jets, cruise missiles, and bunker-busting bombs to cause widespread destruction. Many will interpret stepped-up conflicts between Muslims and Western societies as the beginnings of a new world war.

# Aff Answers

### NEPA BAD

#### NEPA Bad—High costs, delays, and no contribution to legislation

Sweet 9, (Matthias N. Sweet, Graduate Student at University of Pennsylvania, “Hold the Applause, Transportation Investment for Economic Recovery” http://www.design.upenn.edu/files/Panorama09\_04\_TranspInvest\_Sweet.pdf)

Several federal environmental acts during the 1960s and 1970s established a procedure-based policy applicable to transportation planning. President Nixon signed the National Environmental Policy Act (NEPA) in 1970, establish(ed)ing the cornerstone of the environmental review process. Along with creating the Environmental Protection Agency (EPA), this legislation specifies planning procedures for projects that use federal funds. In sum, NEPA establishes a decision-making process through which planners identify and study the presence and severity of possible environmental impacts according to specific guidelines. PANORAMA 2009¶ Practitioners critique the environmental review process for its emphasis on procedure and therefore its high cost, extensive delays, and its use by interests to legitimately or frivolously oppose and hold up any project. However, despite the relative lack of legislative emphasis on outcomes, this procedure-based environmental policy has successfully established a standard for impact analyses.

#### NEPA Adds large delays

DoT 11, (U.S. Department of Transportation, “Docket No. DOT-OST-2011-0025”

<http://www2.apwa.net/Documents/Advocacy/APWA-NACE%20Improving%20DOT%20Regulations%20Comments.pdf>, March 31, 2011)

NEPA: The environmental review and permitting process is a major contributing factor to delays in transportation project implementation. We recommend that, without compromising environmental protection or opportunities for public input, rules be changed to simplify the National Environmental Policy Act (NEPA) and applicable federal regulations to provide clear guidance, make the process outcome-based, provide for a national clearinghouse submittal of NEPA documents, streamline the process, allow greater opportunity for and more definitive guidance on qualifying projects as programmatic Categorical Exclusions, reduce documentation requirements, allow for greater, less burdensome delegation of the Federal Highway Administration’s (FHWA) environmental authority to states, and increase authority for states and USDOT to use programmatic approaches for environmental compliance.

#### NEPA ineffective at influencing federal government action—they can bipass

**Dreher 5**, (Robert G. Dreher, Executive Director of the Georgetown Environmental Law and Policy Institute. Served on the General Counsel of the U.S. Envronmental Protection Agency, “NEPA Under Siege”, http://www.law.georgetown.edu/gelpi/research\_archive/nepa/NEPAUnderSiegeFinal.pdf)

First, various measures simply exempt broad categories of federal agency action from NEPA, effec- tively repealing NEPA as to this type of activity. For example:¶ ■The “Real I.D. Act of 2005,” enacted as part of an Emergency Supplemental Appropriations bill on May 11, 2005,27 empowers the Secretary of Home- land Security to construct barriers and roads along the U.S. border without complying with any legal requirements, including NEPA. The bill authorizes the Secretary to waive “all legal requirements such Secretary, in such Secretary’s sole discretion, deter- mines necessary to ensure expeditious construction” of such barriers and roads, and strips the courts of jurisdiction to hear legal claims (except for alleged constitutional violations) arising from use of this waiver authority. While ostensibly designed to address a specific dispute over a proposed fence along the Mexican border near San Diego, this measure could apply to the construction of any barri- ers and roads in the general vicinity of U.S. borders.

### No warming

#### No warming now

Singer 2k (Testimony of Prof. S. Fred Singer President, The Science & Environmental Policy Project before the Senate Committee on Commerce, Science, and Transportation on Climate Change, July 18, 2000, http://www.nationalcenter.org/KyotoSingerTestimony2000.html)

Contrary to the conventional wisdom and the predictions of computer models, the Earth's climate has not warmed appreciably in the past two decades, and probably not since about 1940. The evidence is overwhelming: a) Satellite data show no appreciable warming of the global atmosphere since 1979. In fact, if one ignores the unusual El Nino year of 1998, one sees a cooling trend. b) Radiosonde data from balloons released regularly around the world confirm the satellite data in every respect. This fact has been confirmed in a recent report of the National Research Council/National Academy of Sciences [1]. c) The well-controlled and reliable thermometer record of surface temperatures for the continental United States shows no appreciable warming since about 1940. [See figure] The same is true for Western Europe. These results are in sharp contrast to the GLOBAL instrumental surface record, which shows substantial warming, mainly in NW Siberia and subpolar Alaska and Canada. d) But tree-ring records for Siberia and Alaska and published ice-core records that I have examined show NO warming since 1940. In fact, many show a cooling trend. Conclusion: The post-1980 global warming trend from surface thermometers is not credible. The absence of such warming would do away with the widely touted "hockey stick" graph (with its "unusual" temperature rise in the past 100 years) [see figure]; it was shown here on May 17 as purported proof that the 20th century is the warmest in 1000 years. 2. Regional Changes in Temperature, Precipitation, and Soil Moisture? The absence of a current global warming trend should serve to discredit any predictions from current climate models, including the extreme warming from the two models (Canadian and British) selected for the NACC. Furthermore, the two NACC models give conflicting predictions, most often for precipitation and soil moisture [2,3]. For example, the Dakotas lose 85% of their current average rainfall by 2100 in one model, while the other shows a 75% gain. Half of the 18 regions studied show such opposite results; several others show huge differences. [see graph] The soil moisture predictions also differ. The Canadian model shows a drier Eastern US in summer, the UK Hadley model a wetter one. Conclusion: We must conclude that regional forecasts from climate models are beyond the state of the art and are even less reliable than those for the global average. Since the NACC scenarios are based on such forecasts, the NACC projections are not credible.

#### No warming—their authors are alarmists

SPPI 07 (The Viscount Monckton of Brenchley, Science and public policy institute, July 2007, http://scienceandpublicpolicy.org/images/stories/papers/monckton/consensus.pdf

Likewise, if one aggrgates up the UN’s central estimates of the contributions of all climate “forcings” and temperature “feedbacks” to the projected warming from increased greenhouse gases, the total comes to just half the UN’s published central estimate of a 3.2C temperature increase in response to a doubling of the atmospheric CO2 concentration. Once again, a large exaggeration is evident, right at the heart of the alarmist case. If the UN’s documents do not even agree with themselves, how can any kind of “consensus” be claimed? The Russian Academy of Sciences and the US Association of State Climatologists are just two of the scientific organizations that have trenchantly expressed serious doubts about the imagined “consensus” on climate change. They have recently been joined by the Administrator of NASA, who has said that it is arrogant to make the Panglossian assumption that today’s climate is the best of all possible climates, and still more arrogant to assume that any of the more or less futile remedial measures which have been advocated will make any significant climatic difference. The Administrator ought to know: for it is his organization that gathers much of the weather data via satellite upon which the rickety edifice of the climate-change “consensus” is constructed. A growing number of scientists who had previously subscribed to the alarmist presentation of the “consensus” are no longer sure. They are joining the numerous climatologists – many of them with outstanding credentials – who have never believed in the more extreme versions of the alarmist case. Indeed, many scientists now say that there has been no discernible human effect on temperature at all. For instance, Buentgen et al. (2006) say: “The 20th-century contribution of anthropogenic greenhouse gases and aerosol remains insecure.

#### No Warming – Models are skewed and ignore multiple factors – satellites are more reliable and prove no anthropogenic warming

Singer 8, (Fred Singer, professor emeritus of environmental sciences at the University of Virginia, 3/08, www.sepp.org/ publications/ NIPCC-Feb%2020.pdf , “Nature, Not Human Activity, Rules the Climate”)

In this Nongovernmental International Panel on Climate Change report, we have presented evidence that helps provide answers to all three questions. The extent of the modern warming-- the subject of the first question -- appears to be less than is claimed by the Intergovernmental panel on Climate Change and in the popular media. We have documented shortcomings of surface data, affected by urban heat islands and by the poor distribution of land-based observing stations. Data from oceans, covering 70% of the globe, are also subject to uncertainties. The only truly global observations come from weather satellites, and these have not shown any warming trend since 1998, for the past 10 years. This report shows conclusively that the human greenhouse-gas contribution to current warming is insignificant. Our argument is based on the well-established and generally agreed upon "fingerprint" method. Using data published by the IPCC, we have shown that observed temperature-trend patterns disagree sharply with those calculated from green-house models. It is significant that the IPCC has never made such a comparison, or it would have discovered the same result: namely, that the current warming is primarily of natural origin rather than anthropogenic. Instead, the IPCC relied for its conclusion on circumstantial "evidence" that does not hold up under scrutiny. We show that the 20th century is in no way unusual and that warming periods of greater magnitude have occurred in the historic past -- without any catastrophic consequences. We also discuss the many shortcomings of climate models in trying to simulate what is happening in the real atmosphere. If the human contribution to global warming due to increased levels of greenhouse gases is insignificant, why do greenhouse-gas models calculate large temperature increases, i.e., show high values of "climate sensitivity"? The most likely explanation is that models ignore the negative feedbacks that occur in the real atmosphere. New observations from satellites suggest it is the distribution of water vapour that could produce such strong negative feedbacks. If current warming is not due to increasing greenhouse gases, what are the natural causes that might be responsible for both warming and cooling episodes -- as so amply demonstrated in the historic, pre-industrial climate record? Empirical evidence suggests very strongly that the main cause of warming and cooling on a decadal scale derives from solar activity via its modulation of cosmic rays that in turn affect atmospheric cloudiness. According to published research, cosmic-ray variations are also responsible for major climate changes observed in the paleo-record going back 500 million years. The third question concerns the effects of modest warming. A major scare associated with a putative future warming is a rapid rise in sea level, but even the IPCC has been scaling back its estimates. We show here that there will be little, if any, acceleration, and therefore no additional increase in the rate of ongoing sea-level rise. This holds true even if there is a decades-long warming, whether natural or man-made. Other effects of a putative increase in temperature and carbon dioxide are likely to be benign, promoting not only the growth of crops and forests but also benefitting human health. Ocean acidification is not judged to be a problem, as indicated by available data.

### No Climate Change

IPCC skewed data in their report to hide flaws in the predictions of Climate Change

Idso et al, 11 (Craig D. Idso is the founder, former president and current chairman of the board of the Center for the Study of Carbon Dioxide and Global Change, along with Robert Carter and Fred Singer, “Climate Change Reconsidered,” 2011, http://www.nipccreport.org/reports/2011/pdf/FrontMatter.pdf)

Hulme also admitted, ―Uncertainty pervades scientific predictions about the future performance of global and regional climates. And uncertainties multiply when considering all the consequences that might follow from such changes in climate‖ (p. 83).On the subject of the IPCC‘s credibility, he admitted it is ―governed by a Bureau consisting of selected governmental representatives, thus ensuring that thePanel‘s work was clearly seen to be serving the needs of government and policy. The Panel was not to be a self-governing body of independent scientists‖ (p.95). These are all basic ―talking points‖ of global warming realists, which invariably result in charges of ―denial‖ and ―industry shill‖ when expressed by someone not in the alarmist camp. To see them written by Hulme reveals how the debate has changed. Just months after Hulme‘s book was released, a large cache of emails was leaked by someone at the Climatic Research Unit at the University of East Anglia. ―Climategate,‖ as it has come to be known, revealed deliberate efforts by leading scientific supporters of the IPCC, and of climate alarmism more generally, to hide flaws in their evidence and analysis, keep ―skeptics‖ from appearing in peer-reviewed journals, and avoid sharing their data with colleagues seeking to replicate their results (Bell, 2011; Sussman, 2010; Montford, 2010). The emails reveal that important data underlying climate policy are missing or have been manipulated. In February 2010, the BBC‘s environment analyst Roger Harrabin posed a series of written questions to Philip D. Jones, director of the Climatic Research Unit (CRU) at the University of East Anglia and the person responsible for maintaining the IPCC‘s all important climate temperature records (BBC, 2010).Jones appeared to back away from many of the foundational positions of the IPCC, admitting for example:  The rates of global warming from 1860–1880,1910–1940 and 1975–1998, and 1975–2009 ―are similar and not statistically significantly different from each other.‖  The temperature trend for the period 1995 to 2009―is positive, but not significant at the 95%significance level.‖  When asked, ―When scientists say ―the debate on climate change is over‖, what exactly do they mean– and what don‘t they mean?‖ Jones replied, ―It would be supposition on my behalf to know whether all scientists who say the debate is over are saying that for the same reason. I don‘t believe the vast majority of climate scientists think this. This is not my view. There is still much that needs to be undertaken to reduce uncertainties, not just for the future, but for the instrumental (and especially the palaeoclimatic) past as well.‖ Climategate was followed by a series of revelations that many of the key ―findings‖ of the Fourth Assessment Report of the IPCC (IPCC-AR4) relied on non-peer-reviewed sources, sometimes little more than the newsletters of environmental advocacy groups. As a result, IPCC had to retract claims about Amazon rain forests, African crop harvests, Himalayan glaciers, trends in disaster losses, flooding in Bangladesh, and more. Evidence of these errors and more could be readily found in Climate Change Reconsidered, but the British media apparently preferred to ―discover‖ and announce the errors intheir own way. The media also ignored an excellent audit of all 18,531 references cited in the AR4 that found 5,587—nearly one-third—were not peer reviewed (Laframboise et al., 2008).

#### Models not accurate

Idso and Singer 9 (Craig D. Idso is the founder, former president and current chairman of the board of the Center for the Study of Carbon Dioxide and Global Change and Fred Singer, American physicist and emeritus professor of environmental science at the University of Virginia, “Climate Change reconsidered” 2009,

The Intergovernmental Panel on Climate Change(IPCC) places great confidence in the ability of general circulation models (GCMs) to simulate future climate and attribute observed climate change to anthropogenic emissions of greenhouse gases. It says “climate models are based on well-established physical principles and have been demonstrated to reproduce observed features of recent climate … and past climate changes … There is considerable confidence that Atmosphere-Ocean General Circulation Models (AOGCMs) provide credible, quantitative estimates of future climate change, particularly at continental and larger scales” (IPCC,2007-I, p. 591).To be of any validity, GCMs must incorporate all of the many physical, chemical, and biological processes that influence climate in the real world, and they must do so correctly. A review of the scientific literature reveals numerous deficiencies and shortcomings in today’s state-of-the-art models, some of which deficiencies could even alter the sign of projected climate change. In this chapter, we first ask if computer models are capable in principle of producing reliable forecasts and then examine three areas of model inadequacies: radiation, clouds, and precipitation.

#### No scientific consensus

Bast and Taylor 11 (Joseph, is president and CEO of The Heartland Institute

James M, managing editor of Environment & Climate News, “Global Warming: Not a crisis” 2011, http://heartland.org/ideas/global-warming-not-crisis)

Science doesn’t advance by “consensus.” A single scientist or study can disprove a theory that is embraced by the vast majority of scientists. The search for a consensus is actually part of what philosophers call “post-normal science,” which isn’t really science at all. Still, many people ask: What do scientists believe? Most surveys cited by those who claim there is a consensus ask questions that are too vague to settle the matter. It is important to distinguish between the statement that global warming is a crisis and the similar-sounding but very different statements that the climate is changing and that there is a human impact on climate. Climate is always changing, and every scientist knows this. Our emissions and alterations of the landscape are surely having impacts on climate, though they are often local or regional (like heat islands) and small relative to natural variation. It is easy to find evidence that scientists disagree about climate change. Climate Change Reconsidered cites thousands of articles appearing in peer-reviewed journals that challenge the basic underlying assumptions of AGW ([Idso and Singer, 2009](http://heartland.org/ideas/global-warming-not-crisis" \l "IdsoSinger)). More than 30,000 scientists have signed a petition saying there is no threat that man-made global warming will pose a threat to humanity or nature ([Petition Project](http://heartland.org/ideas/global-warming-not-crisis#Petition)). Alarmists often cite an essay by Naomi Oreskes claiming to show that virtually all articles about global warming in peer-reviewed journals support the so-called consensus. But a no-less-rigorous study by Benny Peiser that attempted to replicate her results searched the abstracts of 1,117 scientific journal articles on “global climate change” and found only 13 (1 percent) explicitly endorse the “consensus view” while 34 reject or cast doubt on the view that human activity has been the main driver of warming over the past 50 years. A more recent search by Klaus-Martin Schulte of 928 scientific papers published from 2004 to February 2007 found fewer than half explicitly or implicitly endorse the so-called consensus and only 7 percent do so explicitly ([Schulte, 2008](http://heartland.org/ideas/global-warming-not-crisis#Schulte)). A survey that is frequently cited as showing consensus actually proves just the opposite. German scientists Dennis Bray and Hans von Storch have surveyed climate scientists three times, in 1996, 2003, and 2007 ([Bray and von Storch, 2010](http://heartland.org/ideas/global-warming-not-crisis#BrayVonStorch)). Their latest survey found most of these scientists say they believe global warming is man-made and is a serious problem, but most of these same scientists do not believe climate science is sufficiently advanced to predict future climate conditions. For two-thirds of the science questions asked, scientific opinion is deeply divided, and in half of those cases, most scientists disagree with positions that are at the foundation of the alarmist case ([Bast, 2011](http://heartland.org/ideas/global-warming-not-crisis" \l "Bast)). On August 2, 2011, von Storch posted the following comment on a blog: “From our own observations of discussions among climate scientists we also find hardly consensus [sic] on many other issues, ranging from changing hurricane statistics to the speed of melting Greenland and Antarctica, spreading of diseases and causing mass migration and wars” ([von Storch, 2011](http://heartland.org/ideas/global-warming-not-crisis#vonStorch)). These are not minor issues. Extreme weather events, melting ice, and the spread of disease are all major talking points for Al Gore and other alarmists in the climate debate. If there is no consensus on these matters, then “skeptics” are right to ask why we should believe global warming is a crisis.

#### IPCC Predictions are overblown – ignore cycles of warming

Bell 12 (Larry, Environmental contributor to Forbes, “Global Warming? No, Natural, Predictable Climate Change” January 10th, 2012, http://www.forbes.com/sites/larrybell/2012/01/10/global-warming-no-natural-predictable-climate-change/)

An extensively peer-reviewed study published last December in the Journal of Atmospheric and Solar-Terrestrial Physics indicates that observed climate changes since 1850 are linked to cyclical, predictable, naturally occurring events in Earth’s solar system with little or no help from us. The research was conducted by Nicola Scafetta, a scientist at Duke University and at the Active Cavity Radiometer Solar Irradiance Monitor Lab (ACRIM), which is associated with the NASA Jet Propulsion Laboratory in California. It takes issue with methodologies applied by the U.N.’s Intergovernmental Panel for Climate Change (IPCC) using “general circulation climate models” (GCMs) that, by ignoring these important influences, are found to fail to reproduce the observed decadal and multi-decadal climatic cycles.As noted in the paper, the IPCC models also fail to incorporate climate modulating effects of solar changes such as cloud-forming influences of cosmic rays throughout periods of reduced sunspot activity. More clouds tend to make conditions cooler, while fewer often cause warming. At least 50-70% of observed 20th century warming might be associated with increased solar activity witnessed since the “Maunder Minimum” of the last 17th century. Dr. Scafetta’s study applies an astronomically-based model that reconstructs and correlates known warming and cooling phases with decadal and multi-decadal cycles associated with influences of planetary motions, most particularly those of Jupiter and Saturn. This “astronomical harmonics model” was used to address various cycles lasting 9.1, 10-10.5, 20-21, and 60-62 year-long periods. The 9.1-year cycle was shown to be likely related to decadal solar/lunar tidal oscillations, while those of ten years and longer duration relate to planetary movements about the Sun that may have solar influences that modulate electromagnetic properties of Earth’s upper atmosphere which can regulate the cloud system. Scafetta’s findings contradict IPCC claims that all warming observed from 1970 to 2000 has been man-made (“anthropogenically-induced”) based upon models that exclude natural quasi 20-year and 60-year climate cycle contributions. These cycles have been clearly detected in all global surface temperature records of both hemispheres since 1850, and are also evident in numerous astronomical records. The 60-year cycle is particularly easy to observe in significant surface temperature maxima that occurred in 1880-1881, 1940-1941, and 2000-2001. These momentarily warmer periods coincided with times when orbital positions of Jupiter and Saturn were relatively close to the Sun and Earth.A 60-year modulation cycle also corresponds with warming/cooling induced in the ocean surface which appears to correlate with the frequency of major Atlantic hurricanes, and is seen in the sea level rise since 1700 as well as in numerous ocean and terrestrial records dating back centuries. Further evidence of a 60-year cycle is referenced in ancient Sanskrit texts among observed monsoon rainfall cycles. Scafetta believes that a natural 60-year climate cycle associated with astronomical cycles may also explain calendars adopted in traditional Chinese, Tamil and Tibetan civilizations, since all major ancient civilizations knew about 20-year and 60-year Jupiter and Saturn cycles. Indeed, Scafetta pointed out to me that in the Hindu tradition, the 60-year cycle is known as the cycle of Brihaspati, the name of Jupiter, and that every 60 years special ceremonies are celebrated by some populations, such as the Sigui ceremony among the Dogon people of Africa. Proper reconstructions of natural 20-year and 60-year cycles, along with other independent studies, indicate that the IPCC has seriously overestimated human climate contributions. For example, according to all GCM simulations, increased CO2 concentrations should have produced an increased tropical warming trend with altitude, which is contrary to what balloon and satellites observations actually show.GCM interpretations also allege that volcano activity may have contributed an offsetting 0.1-0.2 degrees of cooling influence between from 1970 to 2000. However, that conclusion appears to significantly overestimate the volcano signal because the models predicted deep and large cooling spikes associated with eruptions which are observed to be much smaller in global surface temperature records. Accordingly, this too suggests that the 1970-2000 warming effect attributed to anthropogenic influences should be reduced. Moreover, some of the observed 0.5 degrees of warming recorded by surface stations during the 1970-2000 period which IPCC models associated with human greenhouse gases emissions, may be explained by improperly corrected urban “heat island” effects and other land use change influences.

### No Impact to Warming

#### Global Warming is far off and the impacts are false

Michaels 7, [Patrick J. Michaels, Senior Research Fellow for Policy and Economic Development at George Mason University, Past president of the American Association of State Climatologists, chairman of Meteorology Society, “Global Warming: No Urgent Danger; No Quick Fix” <http://www.cato.org/publications/commentary/global-warming-no-urgent-danger-no-quick-fix>]

Nor would legislation in any state or Washington, D.C., have any standing in Beijing. Although the final figures aren't in yet, it's beginning to look like China has just passed the United States as the world's largest emitter of carbon dioxide. Like the United States, China has oodles of coal, and the Chinese are putting in at least one new coal-fired power plant a month. (Some reports have it at an astonishing one per week.) And just as it does in the United States, when coal burns in China, it turns largely to carbon dioxide and water.¶ What we do in the United States is having less and less of an effect on the concentration of carbon dioxide in the world's atmosphere.¶ We certainly adapted to 0.8 C temperature change quite well in the 20th century, as life expectancy doubled and some crop yields quintupled. And who knows what new and miraculously efficient power sources will develop in the next hundred years.¶ The stories about the ocean rising 20 feet as massive amounts of ice slide off of Greenland by 2100 are also fiction. For the entire half century from 1915 through 1965, Greenland was significantly warmer than it has been for the last decade. There was no disaster. More important, there's a large body of evidence that for much of the period from 3,000 to 9,000 years ago, at least the Eurasian Arctic was 2.5 C to 7 C warmer than now in the summer, when ice melts. Greenland's ice didn't disappear then, either.¶ Then there is the topic of interest this time of year — hurricanes. Will hurricanes become stronger or more frequent because of warming? My own work suggests that late in the 21st century there might be an increase in strong storms, but that it will be very hard to detect because of year-to-year variability.¶ Right now, after accounting for increasing coastal population and property values, there is no increase in damages caused by these killers. The biggest of them all was the Great Miami Hurricane of 1926. If it occurred today, it would easily cause twice as much damage as 2005's vaunted Hurricane Katrina.¶ So let's get real and give the politically incorrect answers to global warming's inconvenient questions. Global warming is real, but it does not portend immediate disaster, and there's currently no suite of technologies that can do much about it.

#### Even if Warming is real, the effects are minimal

Bast and Taylor 11 (Joseph, is president and CEO of The Heartland Institute

James M, managing editor of Environment & Climate News, “Global Warming: Not a crisis” 2011, http://heartland.org/ideas/global-warming-not-crisis)

Alarmists claim global warming will cause massive flooding, more violent weather, famines, and other catastrophic consequences. If these claims are true, then we should have seen evidence of this trend during the twentieth century. Idso and Singer ([2009](http://heartland.org/ideas/global-warming-not-crisis#IdsoSinger)) provide extensive evidence that no such trends have been observed. Even von Storch ([2011](http://heartland.org/ideas/global-warming-not-crisis#vonStorch)) admits there is no consensus on these matters. The preponderance of scientific data suggest sea levels are unlikely to rise by more than several inches, weather may actually become more mild, and since most warming occurs at night and during the winter season, it has little adverse effect (and some positive effect) on plants and wildlife. Hurricanes are likely to diminish, not increase, in frequency or severity ([Spencer, 2008](http://heartland.org/ideas/global-warming-not-crisis#Spencer); [Singer and Avery, 2008](http://heartland.org/ideas/global-warming-not-crisis#SingerAvery)). Higher levels of CO2 have a well-documented fertilizing effect on plants and make them more drought-resistant. Warmer temperatures are also likely to be accompanied by higher soil moisture levels and more frequent rain, leading to a “greening of the Earth” that is dramatically different from the “parched Earth” scenario featured in many biased and agenda-driven documentary films ([Idso, 1995](http://heartland.org/ideas/global-warming-not-crisis" \l "Idso95)). The current best estimate is that, if left unaddressed, by 2060 global warming is likely to have a small (0.2 percent of GDP) positive effect on the U.S. economy and a small (1 to 2 percent of GDP) negative effect on the global economy ([Mendelsohn and Neumann, 1999](http://heartland.org/ideas/global-warming-not-crisis#MendelsohnNeumann)). These estimates are very small and speculative.

#### Cooling Trend means no effect from warming until after 2040

Bell 12 (Larry, Environmental contributor to Forbes, “Global Warming? No, Natural, Predictable Climate Change” January 10th, 2012, http://www.forbes.com/sites/larrybell/2012/01/10/global-warming-no-natural-predictable-climate-change/)

Finally, three major available global surface temperature record sources report a steady-to-cooling trend since 2001. These measurements contradict the strong warming predicted by all IPCC models during the same period that are attributed primarily to a continuing increase in CO2 emissions. Indeed, only one global surface record source shows a slight increase in the temperature since 2001. This occurred because missing temperature data needed to be adjusted or filled in to complete the records…which appears to be the case with NASA Goddard Institute for Space Studies model data resulting from poor sampling during the last decade for Antarctic and Arctic regions and the use of a 1200 km smoothing methodology. The Duke University/NASA JPL study estimates that as much as 0.3 degrees of warming from 1970 to 2000 may have been naturally induced by the 60-year modulation during the warming phase, amounting to at least 43-60% of the 0.5-0.7 degrees allegedly caused by human greenhouse emissions. Additional natural warming can be explained by increased solar activity during the last four centuries, as well as simply being part of a natural and persistent warming recovery since the end of the Little Ice Age of AD 1300-1900.Nicola Scaletta concludes that the scientific method requires that a physical model fulfill two conditions…it must be able to reconstruct as well as predict (or forecast) direct physical observations. Here, he argues that all climate models used by the IPCC can do neither. “They seriously fail to properly reconstruct even the large multi-decadal oscillations found in the global surface temperature which have climatic meaning. Consequently, the IPCC projections for the 21st century cannot be trusted.” In fact, he argues that “By not properly reconstructing the 20-year and 60-year natural cycles we found that the IPCC GCMs have seriously overestimated also the magnitude of the anthropogenic contribution to recent warming.” Unlike the current IPCC models, the astronomical harmonics model can have real climate forecasting value. By combining current trend information with natural cycle patterns Scafetta believes that the global temperature “may not significantly increase during the next 30 years mostly because of the negative phase of the 60-year cycle.” He goes on to say: “If multi-secular natural cycles (which according to some authors have significantly contributed to the observed 1700-2010 warming and may contribute to an additional natural cooling by 2100) are ignored, the same projected anthropogenic emissions would imply a global warming by about 0.3-1.2 degrees C by 2100, contrary to the IPCC 1.0-3.6 degree C projected warming.” Scafetta projects that the global climate may remain approximately steady until 2030-2040 (as was observed from the 1940s to the 1970s) because the 60-year cycle entered into its current cooling phase around 2000-2003. The climate may further cool if additional natural long and short-term cycles also enter into cooling phases. In fact the present warm period may well be at the top of a natural millennial cycle as previously occurred during Roman and Medieval times.

#### Warming reduces amount of hurricanes

Loney 8 (Jim Loney, deputy bureau chief in Baghdad and correspondent for Reuters, “Warming may reduce hurricanes hitting the U.S.” January 23rd, 2008, http://www.reuters.com/article/2008/01/23/environment-climate-hurricanes-dc-idUSN2364087920080123?feedType=RSS&feedName=environmentNews)

Rising ocean temperatures linked to global warming could decrease the number of hurricanes hitting the United States, according to new research released on Wednesday. The study, published in Geophysical Research Letters, challenges recent research that suggests global warming could be contributing to an increase in the frequency and the intensity of Atlantic hurricanes. At the same time, it reaffirmed earlier views that warmer sea waters might result in atmospheric instabilities that could prevent tropical storms from forming. Atlantic storms play a pivotal role in the global energy, insurance and commodities markets, particularly since the devastating 2004 and 2005 hurricane seasons, which hammered U.S. oil and gas production in the Gulf of Mexico. The new study suggests that warmer seas, caused by greenhouse gases blamed for a rise in global temperatures, are linked to an increase in vertical wind shear, a difference in wind speeds at different altitudes that can tear apart nascent cyclones. Hurricanes feed on warm water, leading to conventional wisdom supported by some recent research that global warming could be revving up more powerful storms. But the new study, by oceanographer Chunzai Wang of the National Oceanic and Atmospheric Administration, and Sang-Ki Lee, a scientist at the University of Miami, examined 150 years of hurricane records and found a small decline in hurricanes making landfall in the United States as the oceans warmed. "The attribution of the recent increase in Atlantic hurricane activity to global warming is premature. ... Global warming may decrease the likelihood of hurricanes making landfall in the United States," the researchers wrote. Much of the recent research focused on the total number of tropical storms and hurricanes recorded in the Atlantic Ocean and Caribbean, but Wang said the number of those hurricanes actually hitting the United States is a much better indicator. Prior to the mid-1960s when satellites and other technology made it easier to spot cyclones, some tropical storms and hurricanes lived and died far out at sea, undetected. As a result, scientists trying to track long-term trends in the frequency of Atlantic storms work with uncertain data. "We believe U.S. landings for hurricanes are most reliable measurements over the long term," Wang said. The study found that warming of the tropical Pacific and Indian oceans increases Atlantic wind shear while rising sea temperatures in the tropical North Atlantic decrease shear. The two effects compete, but the net impact is an increase in wind shear in the main Atlantic hurricane development zone, from the west coast of Africa to Central America. "The Pacific and Indian warming wins and the result is a decrease in landfalling U.S. hurricanes," Wang said. In 2004, four strong hurricanes hit Florida, causing billions of dollars in damage across the state. In 2005, a record-breaking 28 tropical storms formed, including Katrina, which killed 1,500 people and caused $80 billion damage. The back-to-back years of unusually intense hurricane activity fueled debate about the impact of global warming.

#### Squo Solves Potential Permafrost issues

Neumann and Price 9 (James E. Neumann, President of Industrial Economics, Incorporated, Mr. Neumann holds a B.A. in Economics and Environmental Studies from Williams College, and a M.P.A. in Public Affairs and Urban and Regional Planning from the Woodrow Wilson School of Public and International Affairs at Princeton University,“Adapting to Climate Change” June, 2009, http://www.rff.org/rff/documents/RFF-Rpt-Adaptation-NeumannPrice.pdf)

Two recent studies expand on issues of infrastructure vulnerability unique to Arctic zones, particularly Alaska. The first, the Arctic Climate Impact Assessment (Instanes et al. 2005), addressed the full range of climate impacts but included a chapter specific to infrastructure.5 The chapter notes infrastructure impacts associated with permafrost warming and degradation, coastal erosion, and transportation routes, among others. Impacts on infrastructure from changes to permafrost due to higher temperatures vary depending on the type of permafrost (continuous or discontinuous), as follows. • In areas of continuous permafrost, climate change is not likely to pose an immediate threat to infrastructure if proper permafrost engineering design procedures have been followed. Maintenance costs are likely to increase, but it should be possible to gradually adjust Arctic infrastructure (through replacement and changing design approaches over time) to a warmer climate. • Projected climate change is very likely to have a serious effect on existing infrastructure in areas of discontinuous permafrost. Permafrost in these areas is already at temperatures close to thawing. The authors believe that engineering experience already employed to address warming and thawing brought on by human activities and construction can help address this