

Integrating Climate Change Adaptation Capabilities into the U.S. Environmental Impact Assessment Process: Prospects According to Practitioners



By Becky Curtis
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Submitted by

Becky J. Curtis
Address: 100 S. Marquette #16
Ironwood, MI, USA, 49938
Email: bjcurtis1979@yahoo.com

Supervisor

Barry Ness, LUCSUS
P.O. Box 170, 22100 Lund, Sweden
+46 46 2220512
barry.ness@lucsus.lu.se

Additional Supervisor

Martin Mikkelsen,
Royal Danish Ministry
of Foreign Affairs
2, Asiatisk Plads
DK-1448 Copenhagen K
+45 33 920000
marmik@um.dk

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Abstract

The problem addressed by this study is neither ‘Is climate change happening?’, nor ‘Are human activities causing it?’ Within the scientific community there is a general consensus that the answer to both of those questions is ‘yes’. The modification of the U.S. EIA could be a tool to adapt to climate change. The objectives of this study are to assess if the EIA process is currently capable of adapting to climate change, and to assess the prospects for integration of such capabilities. Qualitative interviews were given to practitioners of EIA. It was found that currently no climate change adaptation capabilities exist in the U.S. EIA process. Practitioners interviewed during this research believe that it is important, but are not optimistic that this will happen. Most importantly, NEPA regulations do not require the assessment of climate change impacts upon projects. Uncertainty surrounding the climate change issue is also one of the main barriers to this integration. Interview results indicated that climate change adaptation capabilities could be added to the process during the cumulative impacts section, and through the utilization of future projected climate data. Through a literature review, possible stages for modifications of the U.S. EIA were found. They include the screening process, the scoping process, during the comparison of alternatives, and in the cumulative impact assessment portion of EIA. In addition, concerns about the impacts of climate change could be brought up by involved parties after reviewing the EIS resulting from the EIA process.

Keywords: Climate change, Adaptation, Environmental Impact Assessment (EIA), United States

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Acronyms

CEQ.....	Council on Environmental Quality
DCDAP.....	Danish Climate and Development Action Programme
EA.....	Climate Change-Oriented Environmental Assessment
EIA.....	Environmental Impact Assessment
EIS.....	Environmental Impact Statement
EPA.....	(U.S.) Environmental Protection Agency
GHG.....	Greenhouse Gas
IAIA.....	International Association for Impact Assessment
IPCC.....	Intergovernmental Panel on Climate Change
NEPA.....	National Environmental Protection Act
RGGI.....	Regional Greenhouse Gas Initiative
SEI.....	Socio-Ecological Idealism
.....	(Acronyms used for Analysis of Interviews explained in methodology sections)

King (standing next to a serene meadow): ‘I am going to build a grand mall right here!’

Aide: ‘But...what about the environmental impact, Sire??!’

King: ‘Oh, we will build it to withstand anything!’

-unknown

Introduction

1.1. Definition of Problem Area

The problem addressed by this study is neither ‘Is climate change happening?’, nor ‘Are human activities causing it?’ Within the scientific community there is a general consensus that the answer to both of those questions is ‘yes’. For example, it is stated explicitly in the IPCC’s Third Assessment Report (2001, p. 77) that

Human activities [...] are modifying the concentration of atmospheric constituents or properties of the Earth’s surface that absorb or scatter radiant energy. In particular, increases in the concentrations of greenhouse gases (GHGs) and aerosols are strongly implicated as contributors to climatic changes observed during the 20th century and are expected to contribute to further changes in climate in the 21st century and beyond. These changes in atmospheric composition are likely to alter temperatures, precipitation patterns, sea level, extreme events, and other aspects of climate on which the natural environment and human systems depend.

In addition to mitigation of climate change, this research specifically addresses adaptive capabilities. One area of importance could be environmental assessment tools, and their modification to include assessment of how climate change will affect the projects or activities being studied. Environmental Impact Assessment (EIA) has been chosen as the focal planning tool in this study. It is a forecasting tool that evaluates the impacts that processes or projects will have upon the environment (Ortolano, 1984, p. 143, Petts, 1999, p. 10), and was chosen for this study due to its widespread use throughout the U.S. on a wide variety of projects and activities. It is suggested in this study that EIA could be modified to allow climate change-related factors to feed back into the EIA planning process, allowing decisions which are adaptive to changing climatic conditions.

1.2. Important Implications

The financial losses associated with climate variability are increasing (Burroughs, 2003, p. 24). This study assumes that an EIA that is ‘adapted to climate change’ will help to prevent these losses throughout the U.S. The U.S. may be one of the countries more invulnerable to climate change due to its technological capabilities, but it is not immune to financial impacts. If the costs of inaction are realized, the U.S. may be spurred to give climate change issues a higher prominence in policy making efforts. This could be the means by which pro-active climate change behaviours are mainstreamed. Consider that in 2001, the U.S. used economic reasons to opt out of ratifying the Kyoto Protocol (News Release, 2001). If money was a factor in keeping the U.S. from entering into climate change treaties, then it could also certainly be used in a manner to encourage the U.S. to rejoin.

2. Objectives and Scope

The overarching goal of this thesis is to help bring climate change back into the picture for the United States. With this in mind, the aim of the study is to evaluate the prospects for integrating climate change adaptation capabilities into Environmental Impact Assessment (EIA).

Assumptions: The research carried out in this study operates under the assumption that planning methods which are adaptive to climate change will help the U.S. to save money, and that poor planning, or planning that does not take climate change into account will ultimately allow projects to be built or carried out that will not be able to withstand certain impacts of

climate change. This in turn will create financial losses for the U.S. as the projects will fail to carry out their desired purpose (such as levees which are not built strong or high enough), or costs will be incurred simply because the project must be rebuilt.

Whether ‘positively’ in some regions, or negatively in others, the United States will be impacted by climate change (Jorgenson et al., 2004, p. 15). It is therefore in the best interest of the U.S. to be able to evaluate how these impacts will affect projects, and an EIA that can achieve this is an important tool. In the short term, it will avoid immediate financial loss. In the long term, it could help to make more sustainable planning decisions, and also help proactive decisions concerning climate change to become more mainstreamed.

Objectives: The objectives of this study are to assess if the EIA process is currently capable of adapting to climate change. It will then turn to assess the possibilities of integrating such capabilities into the U.S. EIA process. The assessments will be achieved through the analysis of qualitative interviews, and a literature review.

Hypothesis: Steps of the EIA process could be altered to allow it to assess how climate change will affect the projects or activities the EIA.

Scope and Limitations: The issue of climate change is extremely complex. Within this very broad topic of climate change, the scope of this study is limited to gaining insights into NEPA’s EIA with the purpose of increasing adaptation abilities in the U.S. It is neither meant to present the scientific workings of climate change, as this is well understood, nor to present a history of international climate change negotiations, which can be found in detail elsewhere (see, for example, IPCC Assessment Reports and UNFCCC documents). All topics are described in terms that directly relate to the current study. Due to the utilization of qualitative methods, the results of this research cannot be generalized.

Research questions to determine prospects:

1. Does EIA currently contain any kind of climate change adaptation capabilities?
2. At what stages or steps could such adaptation capabilities be integrated into EIA?
3. What factors act as barriers to successful integration?

Finally, suggestions for EIA modification will be given after the consideration of responses of interviewees, supplemented by information from EIA literature.

3. Similar Studies and Actions

Suggestions for better environmental planning methods are not novel; they have been evolving ever since their conceptions. Neither are suggestions for planning with respect to climate change issues. In 1996 Haff wrote about waterfront planning and global warming, suggesting several ways in which to improve planning methods in order to act as mitigation for global warming, and adapt to sea level rise (p. 52-54). Haff discusses many options for planning to react to global warming. One that coincides rather closely with the suggestion made by this study is to involve sea level rise data into the zoning process, resulting in structures being limited to higher ground (Haff, 1996, p. 53). The current study suggests that this type of action be applied to EIA, embodied in the form of climate change adaptive capabilities. Additionally, a study by Wegner, et. al., discusses the need to integrate biodiversity considerations into EIA, stating that this is necessitated due to the fact that “[b]iodiversity has become a central concern

in environmental management over the last two decades” (2005, p. 1). This is even more closely related to the current study, involving the integration of certain considerations into EIA.

On a higher level, climate change adaptation capabilities have been integrated into Denmark’s Development Cooperation in the form an action program called the Danish Climate and Development Action Programme (DCDAP, 2005). As another example, a Canadian partnership called ClimAdapt whose members already offer climate change adaptation services through the use of, as one example, a Climate Change-Oriented Environmental Assessment (EA) (ClimAdapt 2005).

“Mainstreaming climate change into national policies and development planning processes is one of the strategies that most Parties identified as a means to ensure that climate change is given prominence at the national level (Sixth Compilation, Planning, 2005, p. 9)

4. Introduction to EIA

Although EIA is used world wide to aid decision making, it has its roots in North America, with the U.S. becoming the first country to adopt a requirement for EIA (Clark and Richards, 1999, p. 203). It is a comprehensive model, evaluating environmental, environmental health, social, and economic impacts of projects or activities (Petts, 1999, p. 52). This shows that the current model holds a very holistic view. It is also used to promote sustainability (Schrage, 1999, p. 52). One of its main tasks is to predict future environmental impacts of projects or activities, and then try to find ways to mitigate them (Ortolano, 1984, p. 143, also see Petts, Vol. 1 and 2). This mitigation is an important part of the purpose of EIA. If climate change adaptation capabilities are added to the process, it would also become an important adaptation tool with respect to climate change.

EIA is used for projects ranging from crude-oil refineries and thermal power stations, to transportation projects, waste water treatment plants, gas pipelines, mining activities, and more (Jones and Carys, 1999, p. 205). These projects and others are all important for supporting human welfare, mostly through the provision of important services. In addition, and forming part of the motivation for both this research and the selection of EIA as a study subject, they also have a great potential for generating environmental pollution and financial loss if damaged or destroyed.

Partly due to public pressure of the 1960s, the National Environmental Protection Act (NEPA) of 1969 was established (Ortolano, 1984, p. 139). Ortolano (1984, p. 140) highlights a part of Section 101(A), which states that

it is the continuing policy of the Federal Government...to use all practical means and measures...to create and maintain conditions under which man and nature can exist in productive harmony and fulfil the social, economic and other requirements of present and future generations of Americans.

NEPA is currently the driving force behind the environmental impact statement process, as it created the Council on Environmental Quality (CEQ), which is the agency that oversees the implementation of Environmental Impact Statements (EIS) (Clark and Richards, 1999, p. 204, Ortolano, 1984, p. 141).

In sum, the EIA process is a tool used for the assessment of environmental impacts which is driven by federal regulations which are overseen by the CEQ, as a part of NEPA. Simplified, the basic steps of EIA include a screening process which determines if a project will require an EIA, scoping to determine the important issues or impacts to be assessed during the process, and the comparison of project or activity alternatives to determine which will achieve the goals of the project while causing the least environmental impacts (see Clark and Richards, 1999, p. 203-222).

Throughout the literature, the terms EIA, EIS, and Environmental Impact Report (EIR) are sometimes used interchangeably. For the purposes of this study, the process of evaluating environmental impacts will be referred to as EIA. The resulting document is referred to as EIS.

5. Materials and Methods

5.1. List of Materials

The materials used for this study are primary information from interviews with practitioners of EIA. Secondary information was obtained through the review of literature on the subject of environmental planning, specifically on EIA. Additional secondary sources included the review of relevant scientific articles, scientific reports, books, and newspaper articles. Other primary information was gathered from an interview with an official involved with international climate change negotiations, from the Royal Danish Ministry of Foreign Affairs. This primary information served as points of emphasis, and was not weighted in the analysis.

5.2. Methods

A conceptual model was used to better understand systematic relationships between the topics covered in this study. A qualitative interviewing method was chosen to “[...] elicit in-depth answers about culture, meanings, processes, and problems[...] (Rubin, et al., 1995, p. 5)”. The complicated issue of climate change and EIA requires a method which can gain such rich insights. Qualitative research is undertaken in this case to come up with a clearer understanding of the workings of the EIA, and the possibilities of integrating climate consideration into it. Surveys and questionnaires are not tools which would reach deep enough to gain the type of information sought by this research. Much valuable information is available ‘between the lines’, or even in spontaneous conversations that occur.

The interviews utilized a semi-structured format in order to receive more specific information as suggested by Rubin et al (1995, p. 5), while still allowing the interview to maintain a conversational feel, and therefore more spontaneity in responses. A tree-and-branch model (Rubin, et al., 1995, p. 159) was used to give the interviews, with the tree trunk representing the main topic, or climate change and EIA. The different branches of the trees represent the different groups of questions asked about this main issue. The results from the interviews were then analyzed and presented in the ‘Results/Discussion’ Section, which is followed by a section devoted to modifications to EIA based upon the review of literature about EIA.

5.3. The Interview Process

Literature describing the processes of the EIA was reviewed and appropriate interview questions were developed which were relevant to answer the following questions: Is the U.S. EIA currently capable of adapting to climatic changes? What are the prospects for integrating these capabilities if missing? Other main questions were asked in addition to these, including:

1. Is it possible to say what kind of economic losses can be avoided by proper planning?
2. Concerning climate change, the EIA would assess possible contributions of a project to climate change, correct? Does the model in any way assess how the climate of the future in a certain location will affect the project?
3. Does the EIA take into account historical climate data or future projected climate data? (such as temperature and rainfall)
4. Would you say it is important to look at how the environment impacts projects? Specifically, is it relevant to consider how climate change will affect projects?

5. Do you feel that an EIA which incorporates climate change adaptation capabilities would be a stronger method?
6. What kind of climate change adaptation capabilities do you believe could be added to this model?
7. At which steps/stages do you believe these capabilities could be integrated into the EIA model?
8. What barriers would stand in the way of this integration? (Political, social, economical)
9. Has climate change ever been identified as a threat, or has it ever been shown to destroy projects?

The interviews were structured in the sense that questions aimed the conversation to specific topics, and as the conversation flowed, the next appropriate question from my list was asked, and sometimes questions that were not on my list surfaced. It was also sometimes obvious that certain questions were irrelevant within the specific context of an individual interview, and those questions were skipped. Rubin, et al, 1995, state that “[...] the content of the interview, as well as the flow and choice of topics, changes to match what the individual interviewee knows and feels” (p. 6).

Interviewees participating in this study worked with EIA concerning different types of projects. This element of non-continuity was necessitated by the fact that this research paper is investigating the prospects of integrating climate change into the EIA, which is a process driven by federal regulations. It is therefore used throughout the United States on a wide variety of processes and projects. Therefore, it would not suffice to simply interview people who were all familiar with the EIA process concerning the exact same types of projects. Limiting interviews to those people who work within one narrow perspective would not create a clear picture of the prospects for integration into a model which is broad and varying in nature. Also, interviewee quotes were not referenced within the analysis to ensure anonymity.

Interviewee profiles are:

1. Environmental Specialist IV, SWCA Environmental Consultants
2. Professional Wetland Scientist, SEH: Engineering and Multi-Disciplined Consulting Firm
3. Community Development Manager, Engineering and Multi-Disciplined Consulting Firm
4. Senior Environmental Scientist, CZR incorporated: Environmental Consultants
5. Official, USEPA Headquarters
6. Practitioner, Florida Permitting Inc.: Environmental Consultants
7. Practitioner, H.W. Lochner, Inc.: Engineering and Planning Agency

5.4. Qualitative Interview Analysis Methods

The data obtained from the interviews, and follow up questions are analyzed using a coding method mentioned by Rubin, et. al (1995, p. 238). Coding involves combing through the interview information sentence by sentence, looking for statements which are related in subject matter. These statements are grouped together into a category. This was done by creating preset categories, which represent the information specifically sought after by this research. The preset categories which were inspired directly from the research questions of this study are as follows:

‘Existing Climate Change Adaptation Capabilities’, or *ECCAC*: This category contains information on the technical capabilities of the EIA process to evaluate the effects of climate change upon the project or activity studied by EIA. It also contains any current climate change issues within the field.

‘Integration of Climate Change Adaptation Capabilities’, or *ICCAC*: This category contains any comments given by interviewees on the subject of climate consideration.

‘Barriers, or *B*’: This category contains comments about possible barriers to such integration, and also comments about how these barriers may be overcome.

‘Financial Interests, or *FI*’: This category contains comments concerning the financial interests of the project owner, or investor.

Emergent categories were also designated during the coding process. As these do not directly correlate to the research questions, they are listed in Appendix 3. The results of the coding process can be seen in Appendices 3 through 7.

The same categories were used across all interviews given about the EIA process. This allowed for a uniform comparison of information, despite the fact that not all interviewees were asked the exact same questions. This comparison supports the maintenance of consistency, which is one of the criteria used to judge the quality of qualitative research (Rubin, et al, 1995, p. 85).

The purpose of using the coding system is to organize the rich qualitative interview data in a manner which makes analysis easier. It is also useful to utilize the coding method which analyzes all of the interviews in a uniform manner despite the fact that not all questions were asked in every interview. The interviews were analyzed in no particular order. The information from the interviews was sorted into these various preset and emergent categories and will be referred to as ‘statements’. Then, the various categories and information were organized into excel spreadsheets by category.

The process of coding did not weigh the categories in terms of importance, and was also not carried out with the intent of proving statistical soundness, but was simply a method of organization so that interview information was easier to interpret and therefore present.

6. Background

6.1. International Issues

The impacts of climate change are felt globally, and although the U.S. emits more GHGs than any other country in the world at 25.5% as of 2004 (Miller, 2004, p. 451), it is not always the U.S. itself that pays the price for this. The contributions that this pollution makes to climate change result in damages well beyond the U.S. borders. “Most Parties [to the Convention] stressed that they already are experiencing stresses from climate-related events and phenomena [such as] severe floods and drought, adverse effects from changes in the El Niño Southern Oscillation (ENSO) phenomenon, tropical storms and changes in their patterns, saltwater intrusion, storm surges, coral reef damage, and changes in migratory patterns of important fish. “Some countries stated that they are concerned about the long-term sustainability of their arid and marginal regions. (Sixth Compilation, Adaptation, 2005, p. 4)”. It is therefore very important for climate change issues to receive a stronger prominence within the U.S.

6.2. U.S. Economic Impacts of Climate Change

If climate change issues are to receive more attention in the U.S., it is most relevant to discuss the economic impacts that climate change may have upon the U.S. It is difficult to make a statement which claims that the U.S. economy will or will not be significantly impacted by climate change. However, Jorgenson et al. state that “global climate change is likely to have

substantial consequences for the economy of the United States and the welfare of its citizens” (2004, p. ii).

In the agriculture sector, it is thought that the benefits that could be incurred due to climate change are less significant than the costs, and also temporary (Jorgenson, et al., 2004, p. ii).

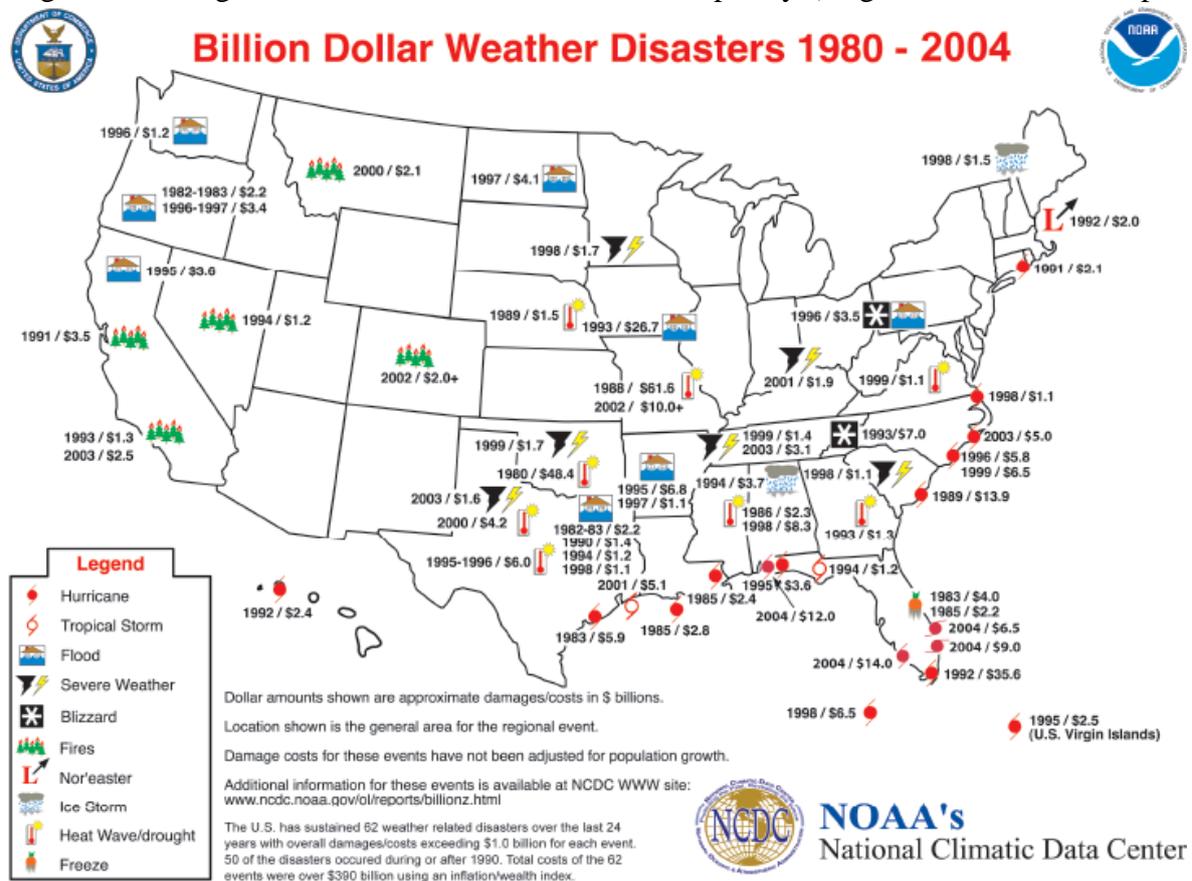


Figure 1. Financial Costs of Weather Disasters in the U.S., 1980-2004

Damages to the economic viability of the agriculture sector may have a powerful ability to setback the U.S. economy as a whole (Jorgenson et al., 2004, p. 32). Jorgenson et al. continue to state that “[t]ogether with forestry, agriculture makes up for 70 or 80 percent of the impacts of climate change on real GDP (depending on whether the optimistic or pessimistic scenarios are used) according to (2004, p. vi)”.

Climate change will affect agriculture most obviously through increasing temperatures and varying amounts of rainfall. For example, in California, important irrigation sources are threatened by climate change. “Current climate-change projections suggest that, by middle of the century, at a least a third of this storage in springtime snow pack will be lost due to the increase in winter temperatures (Schlenker, et al., 2005, p. 1)”.

In addition, some industries are economically dependent on certain weather conditions. Take, for example, the ski resort industry. Many ski resorts face economic difficulties as warmer winters force them to shorten their season each year or spend money on snow making equipment. For example, Hamilton et. al. relate setbacks in New Hampshire’s ski industry, which generated \$556 million in visitor spending, and almost \$58 million in tax revenue with climate change (2003, p. 53). It may be difficult to quantify the actual loss in U.S. dollars that can be linked directly to climate change, but it is important to note how important this industry is to, in this case, the state of New Hampshire, and that climate change has the ability to adversely affect this industry.

Figure 1. illustrates various weather related disasters in the U.S. from 1980 to 2004 (NOAA,

2005). It corresponds these disasters to their resulting financial costs. The figure does not explicitly point to climate change as the cause, but many of the disasters here are commonly known as being affected by climate change. For example, many of these disasters may become more intense, and they may also become more frequent (see Burroughs, 2003).

6.3. Current Attention to Climate Change Issues in the U.S.

To show the level of prominence that climate change has in the U.S., the majority of actions to mitigate climate change in the U.S. seem to be happening on a state level, and not at the federal, and also various industries are voluntarily setting reduction levels for themselves. This shows that the importance given to climate change issues, at least at the federal level, is very low. The U.S. is hesitant to join international agreements concerning climate change (Depledge, 2005, p. 13). “[T]here is a reluctance [by the U.S.] to engage in multilateral agreements and binding multilateral treaties in general. The U.S. does not want to be governed by decisions made in multi-lateral fora, including the UN (RDMFA Official 2, 2005)”.

To give a few examples of companies which have self-imposed emissions reduction targets, Alcoa (an aluminium company) and DuPont have promised to reduce their GHG emissions (Alcoa by 25% below 1990 levels by 2010, and DuPont by 2/3 below 1990 levels) (Goree, 2003).

To make a brief mention of the action being taken on a state level, the example of the Regional Greenhouse Gas Initiative (RGGI) is brought forth. It involves 9 Northeast and Mid-Atlantic states who have voluntarily entered into an agreement that aims to mitigate climate change (RGGI, 2005). However, this action and others like it have occurred with no evidence of being contagious at the federal level. This provides a significant road block when representatives of the federal government are those that participate in international climate change negotiations. This is where modifying EIA, which is driven by federal regulations, could be beneficial. It would constitute a change on a federal level.

6.4. Reasons for Inaction

At the federal level in the U.S., various reasons are used to justify the avoidance of pro-action concerning climate change. Of the most influential reasons, the protection of the economy is high on this list. So is uncertainty about the impacts of climate change. A report by the Council of Economic Advisors in 1990 stated that “the highest priority in the near term [concerning mitigation] should be to improve understanding in order to build a foundation for sound policy decisions. Until such a foundation is in place, there is no justification for imposing major costs on the economy in order to slow the growth of greenhouse gas emissions” (Rowlands, 1995, p. 134). This statement neatly wraps up two of the major reasons for inaction on a federal level in the U.S.

Depledge notes that stakeholder influence, such as that of the energy industry is also another reason for inaction within the U.S. (see Depledge, 2005). Depledge also points out that among other consequences of these influences, journal editors are subject to intense lobbying from interest groups over the climate change papers that they publish (2005, p. 24).

It also does not help that, due to a very complex and non-linear climate system and what is technically called chaotic behaviour” (IPCC TAR, 2005), it is difficult to make long-range weather forecasts which are sufficient for proving that actions are in fact warranted. This makes it difficult to prove to officials that climate change is something which should be paid attention to.

These are just a few brief mentions of the many factors that play into the treatment of climate change issues in the U.S. It is a complex mix of these uncertainties, and influential

groups, among other factors, that keep the U.S. from committing fully to mitigation actions, especially on the international front.

7. Presentation of Conceptual Model

The previous background information together with the following conceptual model shown in figure 2 forms the motivations and foundation of this research. This model of the problem area addressed by this study is presented to introduce the chapters which directly pertain to this issue. These chapters will expand upon the model, and are written with respect to how they are involved within the conceptual model. Topics outside of the core issues presented in the model are not a focus of this study.

The model describes how climate change (1) is altering (2) the environment, through the occurrence of more extreme temperatures, more intense storms, droughts, and floods. The environment is the location for certain projects or activities (6) which are assessed by EIA, which presents the need for adaptation. Currently, the purpose of EIA is to mitigate negative impacts to the environment (4). This perspective is important for the making of sustainable decisions. However, the environment will also have impacts on the projects or processes, represented by arrow (3). The projects and processes, for example infrastructure and agriculture (6), in turn have affect the different dimensions of sustainability (7). The more sustainable the projects or activities, the more they contribute to sustainability. The current research claims that an EIA which is also meant to evaluate the impacts that

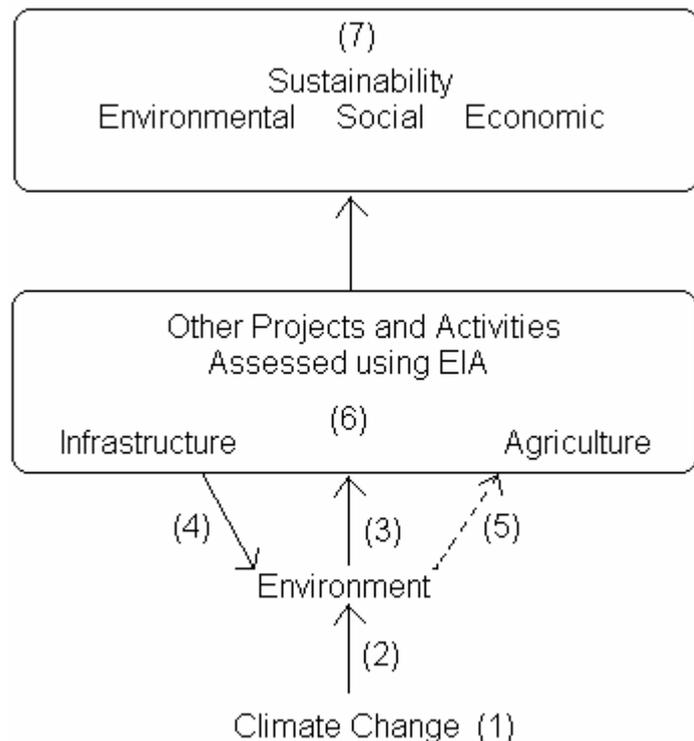


Figure 2. Conceptual Model of System Being Studied

climate change, via the environment, has on the projects or activities will result in more sustainable decisions. This is the motivation for investigating the prospects of integrating climate change adaptation capabilities into the EIA. The following sections are used to describe the conceptual model in more detail, albeit not necessarily in the numerical order given in the model.

8. Current Practice: A One-Way Perspective

In a report 'prepared under a contribution agreement with the Canadian Environmental Assessment Agency Research and Development Programme', Gibson states in 2001 (p. 3) that

Environmental assessment processes – at the strategic as well as project-level and in various kinds of public and private sector planning exercises as well as in formally legislated and labelled environmental assessment regimes – are among the most

promising venues for application of sustainability-based criteria. They are anticipatory and forward looking, integrative, often flexible, and generally intended to force attention to otherwise neglected considerations

This one-way perspective that Gibson refers to is important for making decisions that will contribute to future sustainability. However, it is the claim of this study that there is a missing link from the environment, and therefore climate change, to the project or activity. If there is no feedback mechanism for climate change in EIA, then the messages that climate change is sending are completely lost and unaccounted for. These environmental changes could be sources of failure and if left unconsidered, it would be impossible for the project in question to be carried out in a manner which will withstand future climates.

Zimmerman points out that structural failure of bridges is more likely to occur when they were built without consideration of all sources of failure such as higher water volumes and velocities (1996, p. 63). Planning methods should have the ability to look forward to the type of environment which will exist in the context of climate change. If structures which are vulnerable to the effects of climate change are built stronger, built to endure more extreme temperatures, and in general built with the alterations necessary to withstand the effects of climate change, they will be built more sustainable. Costly repairs to the structures themselves will be avoided, as well as the economic and human costs that could be incurred at the failure of such structures which are vital to society and also vulnerable to climate change. This is the motivation behind modifying EIA so that it becomes a 'new' climate sensitive process, which evaluates the impacts that the environment, or specifically climate change have upon projects and activities.

9. Theoretical Foundations

9.1. Planning Theory

Lawrence illustrates in his paper that the environmental impact assessment process already draws characteristics from five different planning theories (2000). He also points out that planning processes, as well as theories, have evolved over time. A climate sensitive EIA would be another step in this evolutionary process. It would also utilize various characteristics of planning theory, as well as exercise the precautionary principle.

For example, the problem of climate change and its effects on U.S. society presents a very complex problem, with site specific interrelations between technology, economic, environmental, and social factors. It is also a problem which directly addresses not only environmental sustainability, but social and economic sustainability. These factors are closely related to the characteristics of Socio-ecological idealism (SEI) as described by Lawrence (2000, p. 613). "SEI demonstrates to EIA the value of holistic, socio-ecological visions of a desired future, as a touchstone in the evaluation of options and proposals" (Lawrence, 2000, p. 614). This quote underscores the basis of the current study for proposing an EIA which considers climate change, and is therefore more holistic in its consideration of societal and ecological factors.

"Both planning theory and EIA can benefit from initiatives to integrate, transform, and transcend both fields within broader environmental management and sustainability frameworks" (Lawrence, 2000, p. 622). It is suggested in this research that the integration of climate change adaptation capabilities will be one such initiative that will improve both environmental management and also sustainability.

9.2. Improving Sustainable Decisions

In 1987, The Brundtland Report called for a new kind of development, a sustainable development, which: “meets the needs of the present without compromising the ability of future generations to meet their own needs” (WECD, 1987, p. 24). An EIA which examines the impact of climate change upon projects is proposed in this study as a stronger tool for making sustainable decisions. This idea of sustainability has permeated the current environmental, and also social discourse, and is one of the main goals of environmental policy (Mulder, and van den Bergh, 2001, p. 111). It follows that environmental planning models must hone in on this ideal of sustainability as their goals, also. This adaptation is meant to contribute to sustainability, and exercises the precautionary principle.

Miller describes sustainable decision making as that which simultaneously considers environmental, social, and economic spheres of concerns (2004, p. 17). Changing climatic conditions mean that the environmental sphere is changing. The EIA’s capacity for aiding in sustainable decisions would be strengthened if it is able to detect these changes. Its ability to act now in anticipation of the possible impacts of climate change will also exercise the precautionary principle. Many scientists believe that a precautionary approach towards climate change issues should be taken, even some think that scientific evidence is not yet strong enough to warrant action (Miller, 2004, p. 464).

9.3. From Subject-Object to Being-in-the-World

It could be said that achieving an EIA which results in more sustainable decisions and that takes a stronger precautionary approach, would require a bit of a change in how we see our world and our place in it. Currently, EIA exemplifies a subject-object view discussed by DeLuca (2005). The projects or activities that EIA assesses are seen as subjects which affect the environment, or the object. The subjects are seen apart from the object, unaffected by characteristics of the object. DeLuca writes about exchanging this subject-object dichotomy for a being-in-the-world on earth perspective with which to view environmental issues. This being-in-the-world perspective refers to a way of thinking in which we see ourselves as a part of the system, and not just affecting it. Enabling EIA to assess how climatic changes affect projects is a good example of this. Suddenly, the projects or activities become a part of the system, and not only factors which affects the environment without receiving effects in return. It also gives EIA a more holistic view, as it will work with a larger part of the system. This type of system thinking has had an increasing influence on science and helps to more clearly understand complex problems (Haraldsson, 2004).

10. Examples of Importance

10.1. Storms and Infrastructure

Although this paper is not solely focused upon infrastructure, this area is important to point out as an example of an area which could benefit greatly from a planning process which is adaptive to climate change impacts. Coastal infrastructure is one which is especially vulnerable to climate change (DCDAP, 2005, p. 11). Strong storms, especially hurricanes and tropical storms pose immediate threats to these structures. It is thought that climate change will increase the intensity of hurricanes (BBC News (1), 2005). Since 1971, summer cyclones in an arctic region have “[...] show[n] an increase of 0.5 Pa/m² per decade” (Hinzman, et al., 2005). This paper, however, also discusses a lack of evidence for the link between climate change and storm characteristics.

Hurricanes form and gather strength over seawater that is at a temperature of 27°C or more (Burroughs, 2003, p. 64, Bigg, 2003, p. 88). It logically follows that global warming, by

increasing air temperature, will also increase sea surface temperatures, allowing hurricanes to gather more strength and become more intense. In fact, sea surface temperatures are rising along with temperatures over land (Bigg, 2003, p. 210). This evidence taken together with the vulnerability of offshore and coastal infrastructure supports the need for planning which takes into account the possibility for more intense storms due to climate change.

10.2. Environmental and Social Implications

Infrastructure, especially coastal infrastructure for the purpose of this study, is extremely important for societies. It not only provides humans with valuable services, but it can have the effect of protecting human resources and societies located near coastlines (Zimmerman, 1996, p. 57). Zimmerman continues to state the societal importance of protecting infrastructure because it “plays a critical role [...] in protecting [...] human settlements [...]” (1996, p. 57).

A rise in sea level due to climate change can affect infrastructure which provides clean water to coastline communities, allows the proper functioning of wastewater treatment plants, and provides our means of transportation (Zimmerman, 1996). Within the context of this research, the environment may be damaged due to the failure of infrastructure, which could lead to large scale pollution of ecosystems.

10.3. From the Investor’s Point of View

Not only does damaged infrastructure threaten societies in the manners described above, it can also require costly repairs. Flooding can cause damage to infrastructure if the infrastructure is not meant to endure being continuously inundated with water, and flooding can also cause material and structural damages (Zimmerman, 1996, p. 62). Adaptation provides investors with a tool which can save them money. For example, a port terminal located in the Caribbean was destroyed, not once, but twice, in 1999 and in 2000, by extreme weather events. If the possibility of extreme weather events had been taken into account during the planning process, the terminal could have been built to specifications which could have withstood the rough conditions, saving millions of dollars (DCDAP, 2005, p. 11).

As another example, at the height of this research activity, the city of New Orleans, USA, was devastated by Hurricane Wilma, with other storms to follow. A BBC news story pointed out that “[t]he famous levees that were breached could have been strengthened and raised at what now seems like a trifling cost of a few billion dollars (BBC News (2), 2005). This quote is not presented here in a scientific manner, for the author has not verified its accuracy. However, it gives a striking illustration of what we could possibly avoid through proper planning.

11. Results/Discussion

After the above illustration of the importance of an EIA process that assesses climatic changes, we return then to the purpose of this research. In order to discover what the prospects are for the integration of climate change adaptation capabilities into the U.S. EIA, qualitative interviews were given to professionals working with this assessment process. The hypothesis of this study proposed that certain steps or stages of the EIA process may be altered to enable it to assess how climate change impacts the project or process being studied. This hypothesis and research questions have been addressed by the information obtained through qualitative interviews.

The results contained in the preset and emergent categories will be analyzed and discussed below, followed by some conclusions based not upon interview information, but literature review. All facts and resulting discussion in this section are taken from interview results, which can be found in Appendices 5, 6, and 7. These results cannot be generalized and

represent only the viewpoints of those individuals interviewed for this study.

Something that can be seen from the wide variety of resulting categories is that even when researching one or two models, i.e. a small element in the web of the greater climate change issue, the multi-dimensional nature of climate change can be seen. The interview material covered subjects ranging from financial interests, impacts of global warming, social aspects, adaptation, public awareness in terms of uncertainty issues, anthropocentric impacts on climate change, uncertainty, to worldviews. As stated earlier, a full list of emergent categories may be found in Appendix 3.

11.1. Lessons Learned About EIA

Although not directly relevant in answering the research questions, many things can be learned by talking to those who work with EIA. It is worth mentioning a couple of these things briefly to provide a clearer picture of the EIA process.

EIA is a very thorough process; in fact it is the most thorough of environmental assessments, and results in an environmental impact report, or statement. It is a very focused, and project specific process. A lot of detailed aspects about the environment in which the project is to be placed are explored in order to complete this assessment. EIA can also be used on just about any kind of development project, and this is one of the reasons why the author chose the EIA process as a focus.

It seems that not all projects that are carried out require that EIA is performed. This could happen because “[n]ot all projects [...] are dealt with through the federal government”, and would therefore not necessarily be subject to NEPA regulations. It could also happen because “[a] lot of big projects are built with no federal control” and are “[...] only dealt with by local zoning, and therefore not subject to NEPA regulations”. This presents an interesting problem, one which is not covered by this study, but one which has implications for it. If climate change adaptation capabilities were in fact integrated into the U.S. EIA process, this would mean nothing for those projects that were never under federal control from the start.

11.2. Current Climate Change Adaptation Capabilities in the U.S. EIA

When interviewees were directly asked about the current status of climate change regarding EIA, only one statement of 14 suggested that climate change issues could already be considered. It was stated that, if a flood is expected once in every 300 years, “[...] the EIS looks at this, it is important to take into account how this [flooding] will affect structures”. This statement does not explicitly state that EIA currently considers climate change factors. It does, however, provide some evidence of the kind of precautionary nature that EIA can have. Another statement seemed to point to the fact that EIA does not consider climate change, but was positive in the sense that it illustrated the ability of NEPA, which drives EIA, to consider new areas of potential threat. “NEPA has required the strengthening of some buildings because of earthquake predictions. However, NEPA has not made similar changes with respect to climate change”. The other 13 statements regarding this issue all stated that the process did not consider this issue, mostly because NEPA regulations do not require it.

An important aspect of answering whether or the EIA process currently contains any climate change adaptation capabilities is that of perspective. The purpose of EIA is to evaluate how projects or activities affect the environment, as stated in a previous section. Information received from the interviews support this idea, with five of the eight statements saying that EIA looks only at how the project will affect the environment. This one-way perspective makes it hard to imagine that the impacts of climate change on projects or activities could already be included in EIA. However, the remaining statements revealed that EIA does consider how the environment will affect the project, albeit not directly in the manner proposed by this study.

This consideration could happen “[f]rom the applicant’s point of view[. T]hey would think of the environment as being restrictive of what they want to do...the environment is a constraint, dictating what they could or could not do”. This is optimistic in the sense that these tendencies could be built upon to ultimately result in the consideration of climate change’s impacts upon the project.

It is also useful to determine the type of climate data that the EIA process utilizes. Of the nine statements made about the use of climate data (UoCD), three of them showed that the EIA takes weather into consideration. It must be emphasized that this does not mean the model considers climate change, this simply refers to weather. One clearly stated that EIA “looks at weather of the region to put the project in perspective”. The other two stated that it is possible, but not necessary for EIA to look at weather factors. For example, “if the project is tied directly to some aspect of climate, it is mentioned”, and “sometimes weather included, sometimes not”. Another statement in the category concerning climate data claimed that EIA “does not consider climate factors” at all. This is an interesting statement. It is dangerous to conclude from this statement that, in general, the U.S. EIA does not consider climate factors at all. This statement could have been made in reference to a specific type of project which was not closely related to climatic factors.

Taken together, the statements concerning the use of climate data speak of the specific nature of EIA. Whether or not climate is considered when performing EIA will depend on individual characteristics of the projects. It makes sense to examine only those factors directly relating to the project.

Five of the remaining six statements revealed that the kind of climate data that the EIA takes into account is always or almost always historical data. This is an area of EIA in which adaptive capabilities could be integrated. The overall structure of EIA would not have to be changed, simply the type of climatic data that is reviewed. This data could include future projected rainfall patterns, and temperature rises. If EIA does not take into account future temperatures, rainfall patterns, and other changes expected from climate change, projects can not be completely suited for the environment in which it will be located.

The temporal category yields information which is also relevant in answering this question. The statements in this category offer insights into the ability of EIA to look to the future. One statement described the view of EIA as a “snapshot in time”. Another said that “[t]he EA does look a certain distance into the future, and the time period that is evaluated is set by the type of project and the ability to foresee what changes will occur in the future, and the ability to foresee which factors will affect project”. This statement has implications for the integration of climate change adaptation capabilities. If it cannot be determined that climate change is a factor which could be considered, i.e. if there is too much uncertainty surrounding this issue, it may never be opted as a factor to consider. This points to the issue of uncertainty as a barrier, which will be discussed below. Another statement embodies the very essence of this study: “The process could be said to be future oriented using historical data”. As a tool meant to foresee future conditions and therefore produce sustainable decisions, it could be an improvement for EIA to utilize more than the simple projection of past conditions.

11.3. What are the Prospects for this Integration?

11.3.1. What do Practitioners Envision?

Practitioners’ opinions about importance, and about the actual possibilities for integration are two different stories. When asked directly about the integration of climate change adaptation capabilities (ICCAC), a variety of results were obtained. Some statements revealed a full rejection of this possibility: “I cannot see that this is happening”, or “it would not really be useful for us”. When comparing these two statements side-by-side, a couple of implications

can be seen. The former more strictly rules out the possibility. The latter, however, leaves more room for possibilities. Five statements share the view that there is little chance for such integration into EIA. One reason given for rejecting the idea that integration will happen is that NEPA regulations do not require it. Another statement, although rejecting idea, contained a trace of optimism that “[t]he first hints of this kind of thinking are beginning to enter people’s consciousness”. Another five statements address practical aspects of integration, pointing out that it would take a change of federal regulations in order to do this. “[It] would take a politician to promote it as a bill”, and “[i]t would take due process of law to change NEPA”. One response also stated that it could start on a very grass-roots level: “This process could start as an individual private citizen calling local senator, saying I want to see this included or getting petition signed.” These results may be discouraging, but optimistic factors exist as well. Although changing the regulations themselves can be a difficult process, it could also begin on an individual level.

11.3.2. Relevance to EIA

Concerning feasibility, two statements were given to represent both the optimistic side of the issue, and also the negative. One interviewee stated that since climate change impacts on projects will be very project specific, the integration being researched “[t]otally fits with the nature of [EIA], being project specific”. Another respondent seemed less hopeful, stating that while “[p]rofessionally, it could be possible”, it was not very likely.

Some interviewees were unconvinced that the EIA was the right process to be considering. For example, statements were given such as: “regional and strategic impact analyses might be more appropriate for this behavior”, or that “Climate change adaptation capabilities could best be incorporated into a strategic environmental assessment at a regional level, at the planning rather than project stage”. Three statements were also given, suggesting that the kind of considerations that this research suggested would best be carried out at a level of planning either before or after the stage in which EIA is carried out. Another interviewee stated that “His company’s subset of NEPA is not really looking at the things I am talking about, their work is too specific for that”.

11.4. Steps or Sections of the EIA That Could be Modified

Before the practical issue of integration comes the issue of importance, or relevance to EIA. After all, no one will strive to change the process unless there is a perceived need for this action. Interviewee responses on the subject of “relevance or importance” of integration revealed a strong support of the idea that there is a need for the ability to adapt to climatic changes in the EIA. Two different interview categories dealt with the idea of importance. In the first, or “Importance or Relevance of Climate Change Adaptation Capabilities”, interviewees were asked whether or not it is important or relevant for the EIA currently. Twelve of the fifteen statements stated outright that it is important. However, nine of these statements also contained stipulations. For example, importance was perceived only if the project fit certain characteristics. These included: if a climate change related disaster can be expected, if a structure will be built within an area immediately affected by climate change, and if the project is expected to have a long lifetime. Another response stated simply that it depends on the project. It was also pointed out that the project owner should already have these considerations in mind.

The other category in this cluster (IOI) aimed at finding out what the practitioners think, strictly in their own opinion on the subject. A majority of the response (12 of 13 statements) to the question of importance of climate change adaptation capabilities supported the opinion that practitioners consider this to be important. The final statement in this category did not

explicitly evaluate importance, but stated that “[i]t would depend upon the project, and the region in which it is built”. Although this statement does not decidedly say that it is important, it leaves room for the possibility.

Some responses suggested actual possibilities of where climate change adaptation capabilities could fit into the scheme of things. It was said that this integration could take place in metropolitan planning organizations, and also that if integration into EIA were to take place, it would happen in the end of the process, or integrated into the cumulative impacts section. The most interesting responses were those that offered the most simple, and possibly the most surprising solutions. For example, one respondent said that “NEPA rules allow permitting agencies to expand the process, so a rule or law change is not necessarily required”. This response could be the most easily achieved, as it would only require the agreement within the agency, or among the agencies performing EIA. Of course, this does not mean that integration instantly becomes effortless. It is then a question of the perspectives of those carrying out EIA, and their views upon the importance of considering climate change. In addition, this was the only such comment received stating this. Once again, only a small number of interviews were carried out for this research. Conducting this study again with more interviews could help to explore this possibility further.

Since the interview information supported the idea that EIA utilizes only historical climate data, this is also an area of EIA in which climate change adaptation capabilities would fit very well. It would not require a major alteration of the structure of the process, only a switch of the type of analyzed data. EIA could utilize future projected climate data associated with climate change scenario predictions, instead of extending past trends, as it sometimes does according to interview information.

According to interview information, if integration into EIA were to take place, this could happen in the end of the process, integrated into the cumulative impacts section. Types of cumulative effects that are currently considered during the EIA process are (Roberts, 1991, p. 53):

1. the combination of effects from more than one project at the same time
2. the combined “small” effects of one project that result in “large” impacts
3. the combined effects of projects looked at over time

So far, these types of effects are those effects towards the environment. Adding climate change adaptation capabilities to these steps could be “the combined effects of the environment on the project”, with one such factor being climate change impacts. Interview Results!!! Not Literature!

11.5. What are Barriers to this Integration?

Next in the process is the consideration of barriers. What stands in the way of this integration? A variety of barriers were given, dealing with the general themes of general attitudes concerning sustainability, and many factors which all contribute to uncertainty of the situation.

11.5.1. Changing NEPA regulations

Overall, as the interviews made clear, the current EIA process does not take into account climate change factors, largely because NEPA regulations do not require this. This issue was by far the most frequent of responses given as to the reason why climate change is not currently considered in the EIA process. Therefore, it would take a change of regulations to officially require the consideration of climate change issues to be included in the EIA process. As the interview information stated, this could be done by politicians. However, given the previous

description of action on a political level in the U.S., this does not seem a likely option.

11.5.2. Attitudes and Sustainability

Four statements referred to barriers which fall within the general theme of ‘how people think’. It is a setback to the process when “most people don’t think sustainably”, or when “people talk long term but are not really seeing long term”. One interviewee stated clearly that “[t]here would have to be cultural shift to think in long term [...]”. These barriers are some of the hardest to overcome, since this would require a change in the way people think. Another statement hints more closely at issues of sustainability by asking the hypothetical question: “is the owner of a 5000 acre chicken farm actually thinking of the long range future?”. If people cannot think far enough into the future to become concerned about climate change, then integration of climate change adaptation capabilities into EIA will become a very small possibility.

11.5.3. Uncertainty and the Nature of Climate Change

There are many other statements pointing to different barriers. However, upon further examination, it can be seen that most of the barriers mentioned also have direct or indirect effects upon the ability of the applicant to see these impacts, or uncertainty. When asked ‘Has climate change ever been shown to negatively impact a project?’, the response was “[i]t is too hard to prove this”. This once again points to uncertainty as a barrier. It is hard not only for people to predict or understand the impacts that climate change can have on projects, but it is also very hard to prove that any damages are actually due to climate change.

The nature of climate change does not help the situation. Although climate change may be altering the environment at a rate which is very fast on a geological time scale, it is not always so evident during one human being’s lifetime. One statement was made that “[u]sually, it will take too long for climate change to affect projects”. This fact can make it hard for applicants, EIA practitioners, as well as the politicians who could change the process to see why action is important. However, it should be considered that in some areas the impacts of climate change will be felt sooner than in others. Furthermore, in many areas, these impacts are already manifest.

In addition, four statements pointed to the necessity for more scientific information and research on the topic of climate change, so that “people could evaluate what it would mean to them”, and also to “justify the additional expenditure for larger protection projects”. Another statement points out concerns over additional expenditures, saying that “[o]nce a project gets to the size that additional expenditures return reduced protection, the larger project will be at risk”. Project owners may not be willing to pay extra if they are not certain that this expenditure will benefit them in the long run. More scientific research could help to overcome this barrier. However, it might not be as simple as that. Hypothetically, the project owner could have access to hundreds of scientific journals and books which state explicitly that climate change will have devastating impacts. If this multitude of information is not backed also by popular consensus, i.e. if it is not an idea that catches on with the general public, with environmental consulting agencies, then the project owner still may not be encouraged to consider climate change seriously. Most importantly, if NEPA regulations do not change in the face of this hypothetical supply of information, then considering climate remains something that is ‘not required’.

One interviewee stated that the “[l]evel of resistance to a theory or model is a demonstration of how much is unknown”. Therefore the resistance to an EIA which is adaptive to climate change can be related to the uncertainty surrounding the climate change issue.

11.5.4. Issues of Power

From the perspective of private consulting firms, a large barrier exists in the sense that they have no power to actually change the process itself. This statement is contradictory to one given in the section on 'Integration of climate change adaptation capabilities', which stated that NEPA rules allow agencies to expand the process to include what they want. One could conclude from this that although the firms may not have the clout to change the regulations themselves, they do in fact, have the option to include climate change adaptation capabilities if they so wish.

Finally, three statements were made concerning "people with power" who "can lobby against this thing", and the fact that "there are some people out there who don't want climate control mentioned and who pretend it doesn't exist because it benefits their interests". This echoes that which was stated in a previous section about the powerful influences groups. One interviewee pointed out that "laws are written by lawyers and who we elect, and the kind of people who think in those terms [concerning climate change and sustainability] not elected yet in numbers that can effect change in this direction".

11.6. Bringing Climate Change Back into the Picture for the U.S.

Although not directly tested by the research methods of this study, a brief mention of the interview information from the financial interests (FI) category may provide some insight to this topic. This category can easily be summed up by saying that six of the seven statements support the idea that proper and thorough planning can save the investor money. These statements also reflect the situation given previously, about the destroyed terminal and the money that could have been saved through proper planning.

It is the author's claim that the integration of climate change into EIA would constitute a more thorough and improved planning process. Based on the interview information, it could be said that an EIA containing climate consideration would help to save the investor money through the improvement of the planning process.

Investors working with high profile projects in the U.S. will help to get the attention of local and national administrations, and in the words of an official from the RDMFA, "will give [them] a reason why they should look at the effect of the climate on their action and non-actions, and in this way [things will become] more proactive. It costs money not to act [...]. [Money] is often the only reason for change at a government level" (Official from RDMFA). This will provide a reason for those industries who "[...] might prefer to avoid addressing the issue since pollution controls (new or retroactive tooling) is costly [...]" to decide to act instead, and this could be where the current study may also affect the mitigation side of climate change efforts.

However, it must also be made clear further support of this statement would require future research quantifying the financial losses that can be associated with climate change impacts. The interview information indicated that through proper planning, the project owner can save money. This does not explicitly mean that an EIA process which considers climate change will save them money because it considers climate change, per se.

12. Suggestions from Literature Review

Changing NEPA regulations could be a difficult and lengthy process. While this option would be the most concrete, it is also the most unlikely. For example, Ortolano states that legal challenges rarely succeed (Ortolano, 1984, p. 147). In addition, the preceding fact concerned challenges to final EIS results. No example was found of a challenge made towards the regulations themselves. With this in mind, some suggestions for modification of the U.S. EIA process are made based on literature review.

12.1. Modifications

Since NEPA regulations do not currently require evaluation of how climate change impacts projects, it is useful to look at windows of opportunity where this can be integrated without a change of regulations, using the existing model as it is.

For example, following CEQ regulations, “[...] a preliminary analysis is first used to determine whether anticipated impacts will be significant enough to require an EIS” (Ortolano, 1984, p. 142). Some projects may not be thought to cause impacts to the environment which are significant enough to validate a full EIA. However, it is conceivable that these projects could also be vulnerable to climate change. Therefore, at this stage, it could also be beneficial to determine if the project or activity could foreseeably be impacted by climate change, requiring an EIS if so. This could be referred to as ‘climate screening’, as the process of deciding to apply EIA to a project or not is sometimes called screening (Jones, 1999, p. 201). This ‘climate screening’ would ensure that projects which are vulnerable to climate change impacts are not exempted from the EIA process because they are not expected to have significant impacts upon the environment.

During the scoping process, involved parties could voice their concerns about the impacts that climate change will have upon the project, therefore affecting its performance. The requirement for scoping was made to ensure that important impacts were not left out (Ortolano, 1984, p. 142). Climate change impacts on the project could simply be one of these impacts. As stated in the analysis, the impacts that climate change will have upon projects or activities will be very project and location specific. Placing climate change adaptation capabilities at the scoping stage will follow this project-specific rationale, allowing practitioners to identify whether or not they will have a major effect upon the outcome of the assessment for each individual project.

When alternatives are explored, it should be tested how each alternative will stand up to the test of climate change. These alternatives are a major part of the EIA process in the U.S., and it must be demonstrated that a range of alternatives have been considered, in order to choose the one which achieves the goals of the project with the least significant environmental impact (Jones, 1999, p. 203). Project or activity alternatives could be examined not only with the goal of finding the least impacting alternative, but for the alternative which will lead to the project best suited for the climate of the future. If it is determined that the project will be impacted by climate change in its lifetime, it could then be asked: ‘What if none of the alternatives will lead to a project which can withstand climate change?’. When considering this question, it becomes obvious that climate change is something that individual project owners must start to think about. This again leads to issues of public awareness and overcoming uncertainties.

After the draft EIS is prepared, it is sent to various federal, state, and local government agencies, as well as other interest groups and individual citizens in order to receive comments from them (Ortolano, 1984, p. 145). At this step of the process, all of these groups have the chance to review the EIS and voice their concerns and comments. Comments cover a wide variety of topics, but sometimes point out areas of environmental impact that is thought to be missing from EIS (Ortolano, 1984, p. 146).

This would require one or more of the participating parties to have concerns about the effects of climate change, and this makes it more a question comprised of public awareness, and uncertainty issues, both of which were discussed in some form in the analysis. It could also lead to more political issues, if certain parties have a higher level of influence. This seems to be a very relevant step at which to bring up the issue of climate change, but also returns to issues of uncertainty and public awareness.

13. Main Findings

The interview information revealed, as the main findings of this research, that:

- Currently no climate change adaptation capabilities exist in the U.S. EIA process
- Practitioners believe that it is important, but are not hopeful that it will actually happen
- Uncertainty surrounding the climate change issue is one of the main barriers for this integration
- The most important barrier is that NEPA regulations do not currently require agencies to consider climate change impacts upon projects

Based upon the literature review, the main ways climate change adaptation capabilities can be integrated into the U.S. EIA are:

- During the screening process, it can be determined whether or not climate change will have significant impacts upon the project, therefore requiring that an EIA be carried out
- During the scoping process, involved parties could require that climate change impacts upon the project be considered
- Through the utilization of future projected climate data instead of historical data, climate change can more accurately be accounted for
- Climate change impacts upon the project could be considered in the cumulative impacts section
- One of the criteria for judging alternatives should be how well it is expected to withstand the expected impacts of climate change
- Concerns for climate change impacts could be brought forth after involved parties have reviewed the EIS

14. Conclusions

It is widely accepted that climate change is occurring, and that human activities are contributing to this. It is important to identify and improve methods which can help us to do so. It is suggested in this study that EIA could be modified to allow climate change a method by which to feed back into the EIA planning process, resulting in decisions which are adaptive to changing climatic conditions, and therefore more sustainable.

This research used qualitative interviews to find out whether the U.S. EIA currently contains any climate change adaptation capabilities. The interviews were also used to find out what types of adaptive capabilities could be integrated into EIA, and what barriers stand in the way of this happening. Literature was also reviewed to identify modifications which could be made to EIA to accomplish this integration.

It was shown through the interviews that currently, no climate change adaptation capabilities exist in the U.S. EIA process. It was also found that although practitioners believe that this integration could be important, they are not hopeful that it will actually happen. This was due to a number of things, but largely because NEPA regulations do not require practitioners of EIA to consider how climate change will impact projects. In addition, there is a lot of uncertainty surrounding the climate change issue, which makes it hard for all parties involved

to see why considering climate change impacts could be important.

To avoid the issue of changing NEPA regulations, a literature review revealed some ways in which the EIA process could be modified to include climate change adaptation capabilities. These abilities could be integrated into the screening, scoping, and cumulative impacts sections. One criteria for the comparison of alternatives could be how well the project is expected to withstand the expected impacts of climate change. In addition, the EIA process could utilize future projected climate data, instead of simply extending past trends, for example of rainfall or temperature. Finally, concerns for climate change impacts could be presented by involved parties during public participation events.

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Appendices

Appendix 1. EIA Interview

Based on the reading of Just What is EIR? By James Roberts, Environmental Assessment Sourcebook, Vol. 1: Policies, Procedures, and Cross-Sectoral Issues, Environmental Planning and Decision Making by Leonard Ortolano

Questions to evaluate:

climate change awareness

climate consideration existing in models already

integration of climate change adaptation capabilities

1. Do you give your permission for me to contact you again in the near future? New questions are sure to surface upon analyzing the content of this interview.
2. Do you require an interview consent form? If so, I will send one to you.

Introduction Questions

3. Is it possible to say what kind of economic losses can be avoided by proper planning?
4. What are the basic steps of the EIA?
5. Is the EIA used uniformly throughout the U.S.?

Model Questions

6. Concerning climate change, the EIA would assess possible contributions of a project to climate change, correct? Does the model in any way assess how the climate of the future in a certain location will affect the project?
7. Does the EIA take into account historical climate data or future projected climate data? (such as temperature and rainfall)
8. Does the Inventory section take climate into account?
9. The analysis of fit step may contain a description of environmental impacts and mitigation measures. Does the EIA contain any adaptation capabilities?
10. The goal is to reduce significant environmental impacts. In the suggested contents of an EIR, the natural setting must be described. What pieces of information regarding climate are included in this? Past? Future?

Climate Change

11. Would you say it is important to look at how the environment impacts projects? Specifically, is it relevant to consider how climate change will affect projects?
12. Has climate change ever been identified as a threat, or has it ever been shown to destroy projects?

Integration of climate consideration

13. What kind of climate change adaptation capabilities do you believe could be added to this model?
14. At which steps/stages do you believe such integration into the EIA model could take place?
15. What barriers would stand in the way of this integration? (Political, social, economical)
16. How do you think the integration of climate change adaptation capabilities would affect the results of analyses made using the EIA model?
17. Do you feel that an EIA that is adaptive to climatic changes would be a stronger method?

Appendix 2. New EIA Interview

1. Do you know the process as EIA or EIS? And is an Environmental Impact Report essentially the same thing as an EIS?
2. Is it possible to say what kind of economic losses can be avoided by proper planning?
3. Concerning climate change, the EIA would assess possible contributions of a project to climate change, correct? Does the model in any way assess how the climate of the future in a certain location will affect the project?
4. Does the EIA take into account historical climate data or future projected climate data? (such as temperature and rainfall)
5. Does the Inventory section take climate into account?
6. The analysis of fit step may contain a description of environmental impacts and mitigation measures. Does the EIA contain any adaptation capabilities concerning adaptation to climate change?
7. The goal is to reduce significant environmental impacts. In the suggested contents of an EIR, the natural setting must be described. What pieces of information regarding climate are included in this? Past? Future?
8. Would you say it is important to look at how the environment impacts projects? Specifically, is it relevant to consider how climate change will affect projects?
9. Has climate change ever been identified as a threat, or has it ever been shown to destroy projects?
10. What kind of climate change adaptation capabilities do you believe could be added to this model? At which steps/stages?
11. What barriers would stand in the way of this integration? (Political, social, economical) And how could they be overcome?
12. Do you feel that an EIA that is adaptive to climatic changes would be a stronger method? Could it help prevent such human, financial, and environmental losses such as those that happened in New Orleans during Hurricane Katrina?

Appendix 3. Emergent Categories

The large numbers of emergent categories are proof of the richness of information obtained through the qualitative interviews. Only a few broad categories were formed based on the research questions of this study. However, when the information is examined, many other factors rise out of the data. The emergent categories are as follows:

AI: Additional information: this information was not actively sought out by the interviewer, but came up in the interviews and could serve to be useful.

UoCD: Use of climate data: this category is meant to reveal whether the EIA process examines historical climate data, or if it does indeed take into account future projected data. This is necessary information to help induce whether or not the current EIA process is able to take climate change into account

IRoCCAC: Importance or relevance of climate change adaptation capabilities: this category simply represents the interviewee's opinion on whether the integration of climate change adaptation capabilities into the EIA process is a positive, and important step. This category also contains information about the relevance of such integration. This category is similar to the IOI category in that it discusses importance, but is more the importance that already exists, whereas the IOI category contains interviewee's answers to the more specifically stated question of 'In your opinion...'

MR: Model relevance: some interviewees expressed the idea that the EIA model is not relevant for the proposed integration.

SP: Spatial perspective: this category is simply shows the spatial range of where the EIA process is used.

F: Feasibility: Specifically, the idea of feasibility was addressed in the interviews. The

IOI: Interviewee's opinion on importance of integration of climate change adaptation capabilities

P: Perspective (whether the perspective of the EIA is how the project impacts the environment, or how the environment/climate change impacts the project)

PICC: Project's impact on climate change: self explanatory

Cimp: Cumulative impacts of a project: this category contains comments on the cumulative impacts that a project may have and how the EIA deals with this issue.

TP: Temporal perspective of the EIA: this category contains comments referring to whether the EIA has a short term or long term perspective.

CCI: Climate change impacts: contains any mentions of the impacts that climate change is already having or is likely to have.

U: Uncertainty: there are many uncertainties in the climate change discourse, and comments relating to these uncertainties.

S: Storms: self explanatory

M/PI-H: Model/Process information: history or details of the EIA process

M/PI-Ex: Model/Process information: examples of real EIA processes

M/PI-P: Model/Process information: contains comments about the purpose of the EIA.

Appendix 4. Category tallies; number of statements sorted into each category

Information from the following categories was collected:

M/PI-H: Model/Process information-history or details (36 statements)

M/PI-P: Model/Process information-Purpose (1 statements)

M/PI-Ex: Model/Process information-Example (4 statements)

ECCAC: Existing climate change adaptation capabilities (13 statements)

ICCAC: Integration of climate change adaptation capabilities (17 statements)
 IRoCCAC: Importance or relevance of climate change adaptation capabilities (15 statements)
 B: Barriers to integration (15 statements)
 F: Feasibility (2 statements)
 MR: Model relevance (6 statements)
 U: Uncertainty (3 statements)
 IOI: Interviewee's opinion on importance of climate change adaptation capabilities (13 statements)

UoCD: Use of climate data (9 statements)
 TP: Temporal perspective of the EIA-short term? long term? (4 statements)
 SP: Spatial perspective (in terms of where the EIA is used) (1 statement)
 P: Perspective (whether the perspective of the EIA is how the project impacts the environment, or how the environment/climate change impacts the project) (9 statements)

CCI: Climate change impacts (1 statement)
 S: Storms (1 statement)
 PICC: Project's impact on climate change (6 statements)
 Cimp: Cumulative impacts of a project (8 statements)
 FI: Financial interests (investor or project owner's point of view) (7 statements)
 AI: Additional information (5 statements)

In total, (177) pieces of information were collected.

Appendix 5. Cluster one of Categorical Results

Model/Process information: history or details of the EIA process (M/PI-H), Model/Process information: examples of real EIA processes (M/PI-Ex), Model/Process information: purpose (M/PI-P), Use of climate data (UoCD), Spatial Perspective (in terms of where the EIA is used) (SP), Temporal Perspective (TP), Perspective (whether the perspective of the EIA is how the project impacts the environment, or how the environment/climate change impacts the project) (P)

(M/PI-H)

biotic and abiotic factors considered, geology, cultural resources, Indian trust assets, Socioeconomic resources (Environmental Justice), land use, water resources, socio-economic factors, human factors, hazardous material information, waterway information, sensitive species, archaeological concerns, environmental quality (including air quality but not climate change)

“Environmental Impact Statement (EIS) may be chosen if the project is controversial, if there will be a lot of disturbance, or if totally funded by state or federal governments”

“dictated by the national laws on environmental protection, NEPA regulations”

“Based on NEPA and CEQ”

“If there are going to be significant impacts, then an EIA is done resulting in an EIS”

“This is the most detailed of assessment processes”

scoping process

“We must describe the setting, to put the project into context”

“Land use, both future and existing must be described”

“along with information about the existence of endangered species, or habitat, and information about wetlands or floodplains, along with other considerations”

“Alternatives are developed to achieve the purpose of the project, and a comparative analysis is done”

“the process culminates in a formal public hearing”

“There is a subjectiveness in the form of political and social interpretation of hard data”

Secondary effects

Cumulative effects

physical characteristics of soils

current land use

biotic factors

sometimes: archaeological survey

hydrology

“Quantifications are project specific”

“NEPA is zoomed in, not zoomed out to global picture, very project specific”

“The federal highway commission does not build highways, but instead gives money to states who do the road building. In order for states to get this money, they must have an EIS done.”

“Mostly, it is a narrow perspective at the individual project level”

“EIS is the most thorough”

(M/PI-Ex)

involving environmental justice

“I am working with a power plant project now-there are air quality monitoring activities for a project like this which does have emissions” (with respect to PICC)

“Sometimes we must create retention ponds to protect the projects” (respect to how the environment affects projects)

open pit mine with 20 to 50 year planning document (referring to financial issues, see interview for details)

(M/PI-P)

“EIS can be applied to nearly any development project”

(UoCD)

“sometimes weather included, sometimes not”

“looks at weather of the region to put the project in perspective”

“if the project is tied directly to some aspect of climate, it is mentioned”

“almost always it is historical data that they look at”

“they might take past weather trends and extend them”

“The model does not consider climate factors”

“Typically historical data”

“Sometimes they examine rainfall data, and this data is historical, and not projected rainfall data”

“historic data”

(TP)

“snapshot in time”

“The EA does look a certain distance into the future, and the time period that is evaluated is set by the type of project and the ability to foresee what changes will occur in the future, and the ability to foresee which factors will affect project”

“The process could be said to be future oriented using historical data”

“is the owner of a 5000 acre chicken farm actually thinking of the long range future? (hypothetical)”

(SP)

“EIS is used everywhere”

(P)

“evaluating future impacts to the environment”

“is it important to look at how climate affects projects? in some cases”

“They do however have to demonstrate the projects effect on air quality (air quality analysis)”

“They examine only the impacts of the project on the environment”

(Does the model in any way assess how the climate of the future in a certain location will affect the project?) “it would depend on type of project”

“It could take into account both ways.”

“No, they do not look at how climate change affects the project”

“The rules and regulations concerning the EIA do not require that this kind of consideration is done” (how climate change will affect the project)

“From the applicants point of view, they would think of the environment as being restrictive of what they want to do....the environment is a constraint, dictating what they could or could not do.”

Appendix 6. Cluster two of Categorical Results

Project’s impact on climate change (PICC), Existing Climate Change Adaptation Capabilities (ECCAC), Integration of Climate Change Adaptation Capabilities (ICCAC), Importance/Relevance of Climate Change Adaptation Capabilities (IRoCCAC), Barriers (B), Feasibility (F), Model Relevance (MR), Uncertainty (U), Interviewee’s Opinion on Importance (IOI)

(PICC)

“At this company, we are working on specific projects in isolation and it is hard to assess global and regional impacts.”

“Is this considered? It depends on whether or not there will be emissions effects, so it is very project specific.”

“If it deals directly with emissions, it would be prudent of the applicant to evaluate emissions”

“How a project will affect climate change could be included in the cumulative impacts section of an EIS”

“Projects are so small that their contribution to global climate change are not considered”

“Most agencies would be aghast if they had to assess how they impact climate change.”

(ECCAC)

“there are no EISs that would look at the factor of climate change”

“Not talked about on a regular basis. Not something we work with”

“climate consideration: now, it is not included”

“in the vast majority of documents that are produced, climate change per se is not mentioned”

“How does climate change affect projects? If they are close to the ocean, it could affect them, but this is not considered seriously right now.”

“I have never seen a NEPA document with this as a section”

“The scope of most of projects is so short term in relation to the time it takes for climate to change that it is not considered.”

“The whole climate change issue and its assessment in environmental planning not something I have run into.”

“There are of course some places which you should not locate a road or a bridge, these places would not support such structures. But they are not looking so far to the future as to examine how climate change might affect a project”

“is not required to do this (thinking about how climate affects the project)”

“Not required to be looked at according to NEPA regulations.”

“NEPA has required the strengthening of some buildings because of earthquake predictions.

However, NEPA has not made similar changes with respect to climate change”

“so the EIS looks at this (if you expect 3 foot floods once in every 300 years, it is important to take into account how this will affect structures)”

(ICAC)

“I cannot see that this is happening” (looking at how the environment affects project)

“I do not see a large possibility for that”

“it would not really be useful for us”

“The first hints of this kind of thinking are beginning to enter people’s consciousness, but he can see nothing big happening along those lines, but wishes it would.”

“the kind of macro analysis that you are suggesting is not really required under NEPA”

“would take a politician to promote it as a bill”

“once it becomes law, then becomes part of procedure”

“It would take due process of law to change NEPA”

“This process could start as an individual private citizen calling local senator, saying I want to see this included or getting petition signed.”

“Senator or rep. goes to higher organization and says that NEPA needs to be changed to include climate control.”

“If it were, it would be guided by regulations and the connection between project and possible impacts.”

“This could happen at metropolitan planning organizations” (dealing primarily with transportation planning).

“I think a good portion of the decision-making will have to do with the cost/benefit ratio and the risk to human life and property”

“Yes, it could be an add on” (climate change consideration)

“NEPA rules allow permitting agencies to expand process, so rule or law change not necessarily required”

“If it was: it could come into play in the end of the process...under environmental quality or socio economics.”

“Could be integrated into the cumulative impacts or mitigation sections.”

(IRoCCAC)

“important to take into account how this (flooding, for example) will affect structures”

“if you can expect some kind of disaster, even on minor level, you must address this.”

“if you were going to build a tower very near to the shore, then it would be appropriate, geographically, to look at how climate change will affect sea levels.”

“But if in a problem area...with the current rate of climate change it is important”

“the importance of considering climate change will be relative to location”

“It is project specific.”

“relevant for long term projects”

“good example would be nuclear power plant....better pay attention to tidal change and water”

“Streets, roads, and bridges must withstand extreme cold and extreme heat, and if a project is to be located in a floodplain, it is important to look at how climate change will affect it...etc.”

“relevant if projects are located where sea level rise is an issue”

“relevant if project has long life time”

“relevant if building roads in low lying environments”

“relevant if building an offshore platform”

“Should be something that the applicant would be doing on their own anyway”

“In the nation's Breadbasket....can we grow in the future the wheat we grow now?”

(B)

“Usually, it will take too long for climate change to affect the projects”

“Private environmental consulting firms do not have the power to change the process”

“there are some people out there who dont want climate control mentioned and pretends it doesnt exist because it benefits their interests”

“people with power can lobby against this thing”

“Overcoming barriers would involve the history of science and research in climate change and whether or not there is real conclusive determination on the scientific evidence side”

“In terms of overall climate change, science would need to have more history and clarification before people could evaluate what it would mean to them”

“the significance of climate change needs to be further substantiated for laypersons, and I think the potential impacts of those changes need to be further defined”

“Once a project gets to the size that additional expenditures return reduced protection, the larger project will be at risk” (relate this to the category of Uncertainty also)

“Additional data of the potential for larger storms in the future could help in that it would make the potential risk greater and thereby justify the additional expenditure for larger protection projects.”

“people talk long term but not really seeing long term”

“There would have to be cultural shift to think in long term, american indians 7th generation considerations”

“hard for applicant to see impacts from climate change”

“sustainability is like biodiversity or ecosystem management...buzz words...wonderful research but concepts are so integrative and we are still so compartmentalized in our understanding of science and the world”

“most people don’t think sustainably”

“laws written by lawyers and who we elect...The kind of people who think in those terms not elected yet in numbers that can effect change in this direction”

(F)

“Totally fits with the nature of EIS, being project specific”

“Professionally, it could be possible (but not likely...)”

(MR)

“What i am talking about is done post EIS which provides analysis of impacts they expect....and then they decide, ok, now what do we really need to do and what are risks that could occur?”

“regional and strategic impact analyses might be more appropriate for this behavior”

“This could be done earlier in the planning process, when bigger scale impact assessments take place”

“the highest liklihood of this fitting into the process would be before it gets to the point where he deals with it, at the local and regional planning level”

“Climate change consideration could best be incorporated into a strategic environmental assessment at a regional level, at the planning rather than project stage”

“His company’s subset of NEPA is not really looking at the things I am talking about, their work is too specific for that.” (MISUNDERSTANDING??)

(U)

“Level of resistance to a theory or model is a demonstration of how much is unknown”

“Look at arguments that exist about climate change...know little about currents, pump, and what are drivers”

“like death by 1000 cuts, sooner or later you have lost too much blood. How do you know when death will come”

(IOI)

“it is important, permanent installations especially”

“In your opinion would it be stronger? (EIA with CCC) Yes, but still goes to project scope and location, and only if climate change is really a relevant factor”

“More of this should be done though” (assessing how climate affects the project)

“Personally, he thinks that it is important”

“Yes, if those considerations of secondary and cumulative affects were examined”

“It is possible that it could be important.”

(Is an EIA with CCC stronger?) “It is possible, in an instance like new orleans, it is almost cost benefit analysis...potential for large storm like that had to be weighed against capital costs of protecting city....200 year storms versus 300 years...return on investments is minimized the further you go.”

“I agree that, particularly for the hurricane damage and the currency of the issue, that consideration of climate change and the potential for larger hurricanes in the future should be included in planning.”

“It could be important”

“Yes, it is definitely important to look at how the environment impacts the projects”

“It would depend upon the project, and the region in which it is built.”

“aspects of large projects could gain from a longer range view, including not only climate change consideration, but also other sustainability concerns”

“it is not such a crazy idea to say that assessment models should consider how climate change will affect projects. Maybe levees in places like New Orleans could be built up stronger in the first place in this case”

Appendix 7. Cluster three of Categorical Results

Climate change impacts (CCI), Storms (S), Cumulative impacts of a project (Cimp), Financial interests (FI), Additional information (AI)

(AI)

“As a wetland scientist, I would hope that the potential for larger and/or more frequent storms would also support the restoration of coastal wetlands in areas at risk from hurricanes, not just engineered protection projects”

“Not all projects which are built close to the sea are dealt with through the federal government.”

“Some are only dealt with by local zoning, and therefore not subject to NEPA regulations.”

“A lot of big projects are built with no federal control”

“The availability of water will also influence the situation. Will it be drier? Wetter? Usually in the U.S., the same amount of rain falls every year, but the distribution of rainfall changes. This is what may happen with climate change”

(CCI)

(Has climate change ever been shown to destroy projects?) “It is too hard to prove this.”

(S)

“yes, it is predicted that hurricanes will be getting stronger”

(Cimp)

“Actually, NEPA does require that secondary and cumulative effects be studied, but it is not always done.”

“These activities are very difficult and not a lot of people feel comfortable with this”

“The trend in his industry: there is beginning to be a need to examine secondary and cumulative effects based on citizen pressure”

“People are starting to do this more carefully. However, it is tricky because they are a private firm, and clients would not be likely to pay for this, although this is changing, and tends to vary by region of the country.”

“it does address cumulative impacts, projecting what might happen”

“But in reality the cumulative impacts section does not receive the level of analysis of other sections”

“The EIS process does not assess the impacts of a system of roads together, but only as individual projects”

“The cumulative effects of all of the planes flying in the air at once are not studied, only the take-off and landing of planes in the immediate project area. It would be a horrendous job for someone to have to evaluate the cumulative effects of all planes. (O'hare example)”

(FI)

“proper planning contributes to the economic viability of a project”

“The more thorough the planning, the better off the project owner is”

“good planning could avoid economic losses”

“proper planning definitely saves the investor money. It includes involving appropriate associations in the process. This not only saves money, it saves time”

“proper planning could save the client money” (see interview for details)

“proper planning could also take longer and cost you money”

“industries might prefer to avoid addressing the issue since pollution controls (new or retroactive tooling) is costly, would be happy to pollute as much as possible, because it is cost effective”