

MEETING MINUTES
The Human Impacts of Climate Change Advisory Committee Meeting
October 15-16, 2007
Hilton Alexandria Old Town
Alexandria, VA

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NOTICE

The minutes were prepared by Versar, Inc., an EPA contractor, as a summary of the discussion held at the Human Impacts of Climate Change Advisory Committee Meeting (October 15-16, 2007). The minutes capture the main points and highlights of the workgroup meeting. It is not a complete record of all detailed discussion, nor does it embellish, interpret, or enlarge upon matters that were incomplete or unclear. Statements represent the individual views of each participant.

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1. INTRODUCTION

1.1. Work Group Purpose

The Human Impacts of Climate Change Advisory Committee (HICCAC) Meeting was sponsored by the National Center for Environmental Assessment (NCEA) and held on October 15-16, 2007 in Alexandria, Virginia. In this meeting, an expert panel convened to conduct a peer review of EPA's draft report *Synthesis and Assessment Product 4.6: Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems* (SAP 4.6).

1.2. Meeting Attendees

The meeting was attended by 22 people and included participants from academia, federal government, state government, and the public. The list of attendees is presented in Appendix A.

1.3. Agenda

The meeting agenda is presented in Appendix B. The meeting began with opening remarks by Dr. Peter Preuss, Director of the National Center for Environmental Assessment. This was followed by opening statements by Ms. Joanna Foellmer, the Designated Federal Officer. Introductions were made by the two co-chairs (Drs. Thomas Dietz and Barbara Entwisle) as well as by the expert panel members. Background information on the development of the draft report was provided by Dr. Janet Gamble, the convening lead author. For the remainder of the two-day meeting, expert panel members discussed the charge questions (Appendix C) and issues associated with individual chapters, and then drafted summary recommendations.

1.4. Meeting Summary Report

This report summarizes the meeting presentations and discussion, with appendices that provide handouts and presenters' materials.

2. DAY 1 - DISCUSSION

2.1. Introductory Statements

Dr. Preuss gave the opening remarks for the peer review meeting. He emphasized the importance of the advisory panel's task, particularly as the document being reviewed was the first of the SAP documents to undergo review. He invited the advisory panel to provide a critique of the report, to determine if the report represents the state of the science and to determine its accuracy. He noted that EPA is interested in understanding what direction future research should take, particularly since EPA is an important agency in the world of climate change. Of the SAP documents, human health is the least understood portion, and may require the most attention. Dr. Preuss acknowledged the many authors of the report (over 30 total) and gave key recognition to Drs. Gamble, Frances Sussman and Kristie Ebi.

Ms. Foellmer thanked the members of the advisory panel on behalf of EPA. She then provided some background information regarding HICCAC and her role in the process. HICCAC is a federal advisory committee that has been convened to provide advice and suggest revisions to the substance of SAP 4.6; however, responsibility for revising the report still lies with EPA. Advisory committee meetings are always open to the public. Only issues that are solely administrative are exempt from this requirement. The DFO must be present at all meetings and conference calls. All committee meetings must be made available to the public, and the DFO

ensures that all ethics regulations are met. Ms. Foellmer stated that she would like to see the advisory committee produce a draft final report as early as December.

Dr. Dietz, the Panel Chair, asked panel members to introduce themselves. All members present were introduced. On the first day of the meeting, there were no participants on the conference line. On the second day, Dr. Jonathan Patz participated via the conference line.

Dr. Gamble gave a description of the state of the other SAP reports. She also noted that the SAP 4.6 report began with a prospectus review in 2006. The first draft was reviewed by EPA scientists and policy analysts and was then subjected to public comment. During the comment period, more than 600 comments were received, copies of which are available to advisory panel members. After this meeting, the advisory panel is expected to produce a comment response document. Hopefully, the report can be completed by the year's end.

Dr. Gamble highlighted two issues that the advisory panel should address: the research recommendations made in Chapters 3, 4, and 5, and the report's handling of uncertainty. This was an issue raised in many of the comments from the public. Also, she reminded the panel that EPA is in the process of creating a communication document.

Dr. Gamble then discussed the status of the other SAP reports. The ecosystems section panel (SAP 4.4) will meet with their FACA panel during the week of October 22. Dr. Michael Slimak, NCEA Director for Ecology and Global Programs and EPA Chair of the Synthesis and Assessment Advisory Product Group, noted that a draft was expected by November for the sea level rise report (SAP 4.1). It was suggested that the authors read the drafts before the next meeting; however, it was noted that, though feasible, it might be difficult for many participants to read the drafts due to the demanding schedule.

Dr. Slimak was invited to address some questions raised by the workgroup. He noted that the synthesis assessments should be designed to be stand-alone products, even though the topics they address are not stand-alone. In the future, EPA may decide to create a synthesis of all five reports, but this synthesis would not be created until after the five reports are finalized. There is a lawsuit underway that calls for Climate Change Science Program (CCSP) to perform an assessment, and as part of the lawsuit, the 2nd national assessment may be produced.

Dr. Dietz stated that, while it may be appropriate for the panel to comment on general issues associated with the SAP reports, the focus of the advisory panel should be on improving their specific portion of the full report. NRC has a variety of products underway to respond to the larger picture issues. He sees the task of the advisory panel as being a tiered task. Once everyone has made comments on specific chapters, those comments become part of the panel's input. Also, the panel needs to address the charge questions posed by EPA. He stated that if all of the panel's time is devoted to talking about the limitations of the larger product, the panel will not have time to address the issues specific to the portion assigned to it.

Dr. Susan Stonich stated that there is a lack of a conceptual framework in the SAP reports as a whole, and that pulling all the separate reports together will be difficult.

Dr. Gamble stated that the intended audience for the report is broad and varied, and that the audience may not necessarily be scientifically trained. Federal agencies will be interested in information regarding the impacts of climate change and the research information. Public health

circles will have an interest in the occurrence of extreme events. There may also be state and local interest from entities such as resource managers and transportation departments, as well as private sector interest. It is important to provide credible science, but the report must also be accessible to a general audience. The purpose of the SAP reports is to capture the state of the science in a synthesis. The reports are restricted to reporting only what is available in published literature. However, this report will not be the 2nd national assessment. Dr. Dietz suggested that the panel comment on how well the report speaks to different types of audiences. Dr. Howard Frumkin stated that this task may be the most important of the advisory panel. In addition, he suggested that the report address the issue of how to communicate information to the public. Dr. Roger Pulwarty added that since the report is to be a stand-alone product, a discussion of communication issues would be appropriate.

2.2. Charge Questions

The advisory panel reviewed the 8 charge questions provided by EPA and decided on the order in which the questions should be addressed. However, the panel did not specifically discuss all the charge questions. A summary of the panel's discussion is provided below.

2.2.1. General Comments

Dr. Stonich stated that it is important that the key terms be defined for each chapter, and that all chapters use similar terminology. For example, Chapters 3 and 4 describe vulnerable groups with a different degree of specificity. The examination of vulnerable groups/impacts should be performed in a similar way in all chapters. Perhaps a matrix could be used that is repeated across chapters. Ideally, the language used in the report is not only consistent throughout the report, but also consistent with language used outside of the report.

Dr. Jonathan Patz stated that the writing styles for the three chapters need to be made more uniform.

Dr. Stonich stated that Chapter 4 is the only place in the report in which the issue of race is raised. A report on African Americans and climate change was cited, but there is more information available, including a more recent report on toxic waste and race in the United States.

Dr. Patz stated that Chapter 4, though containing good material, did not back up its information with enough references.

Dr. Entwisle stated that while the scope of the report is on impacts incurred by the United States, international issues should still be considered, insofar as they affect the U.S. There is a global aspect that has been missed. Dr. Stonich suggested that one method of addressing global issues is to reference the most recent IPCC reports.

Dr. Entwisle believes that non-English speakers belong in the assessment, and that immigration trends should be clarified. Specifically, Dr. Entwisle noted that immigration is more nuanced than appears in the report and that it has been reduced as an issue of population growth. Dr. Stonich called attention to anti-immigration groups that have publicized the negative environmental impacts of immigrants.

Dr. Eugene Rosa stated that, by relying heavily on IPCC reports, the report does not describe well the variation between different regions in the United States.

Dr. Dietz stated that the report implies that climate change is not a primary issue, without citing sources.

Dr. Dietz noted that, in the report, conclusions were made without being backed-up by any references (e.g., a statement to the effect of “climate change is not of primary importance”). Rather than draw conclusions that can not be substantiated, it would be better to highlight the research needs required to determine this information. He noted that the report should point out that a lot more work needs to be done.

Dr. Dietz thinks that the economic costs for reducing climate change should be compared to adaptation strategies. In addition, there should be discussion of important factors that allow some communities to adapt better than others.

Dr. Dietz stated that the IPCC and Millennium Ecosystem Assessment are scenario-driven exercises, which this report is not. There should be some discussion about why this is the case.

Dr. Pulwarty stated that the recommendations made in the report for improving capacity are not proven.

Dr. Pulwarty believes that the list of impacts presented in the report could be better described by including more information and assigning grades like “primary”, “secondary”, and “tertiary”.

Dr. Pulwarty stated that there needs to be more information about impacts to vulnerable populations such as older Americans and females. Dr. Entwisle thinks that the increase in single adult households is a demographic trend that needs to be recognized.

Dr. Entwisle believes that, in addition to looking at disasters, it is important to look at impacts short of disasters. It may be that smaller, more frequent events cause more impact than larger events. However, Dr. Pulwarty noted that it may be difficult to find literature on the topic.

2.2.2. Charge Question: Does the Committee agree that Chapters 3, 4, and 5 accurately describe the key findings and recommendations with respect to climate change impacts and adaptation on human health, human settlements, and human welfare?

Dr. Rosa noted that some statements made in the chapters are not supported by the most current science.

Dr. Dietz suggested that, where there is a lack of understanding of climate change, the types of analysis that could lead to better understanding ought to be listed, along with a description of the data required for the analyses, and, where applicable, a statement that such data were unavailable at the time of the report.

Dr. Frumkin noted that there are concurrent demographic changes that need to be considered. For issues such as the depletion of major aquifers and peat petroleum reserves, some forecasting should be done.

Dr. Frumkin believes that the overall tone of the document is too reassuring and sanguine. Because the overall bad health impacts greatly outweigh the good health impacts, the tone should be more serious.

Dr. Frumkin believes that the list of impacts should be better organized. He also noted that the serious discussion in the welfare chapter regarding fewer opportunities to go skiing is inappropriate. This issue is not very important; however, it is getting elevated, while some of the big pictures issues are not mentioned at all. However, other panel members argued this point. Dr. Rosa noted that snow pack may affect hydroelectric power availability, which in turn could lead to an increase in greenhouse gases as other alternative energy sources are used. Dr. Dietz noted that recreation is one of the biggest industries for some states, and a decline in recreation business can be serious for the economy. Dr. Stonich noted that tourism is a major financial sector, and the report should deal with recreation and tourism issues.

Dr. Frumkin believes that the issue of “security” deserves more attention (i.e., confidence that the world will continue). It is one of the biggest human welfare issues and he believes it needs to be included. Dr. Rosa noted that “ontological security” may be the more precise term to use (the notion that things will be relatively same tomorrow as today).

Dr. Rosa stated that the report uses the terms “welfare” and “well-being” synonymously. In fact, the terms are distinct, and “human welfare” includes issues like human health and settlement. He suggested that either the chapter be moved, or the definitions of “welfare” and “well-being” be made more explicit.

Dr. Patz does not think that the three substantial chapters (3, 4, and 5) connect well with each other. For example, the issue of tourism could be brought across all chapters.

Dr. Entwisle stated that the report should do a better job of discussing temporal, social, and spatial scale. If these scale issues cannot be treated appropriately because of a lack of data, it is important to emphasize the need for such data.

Dr. Entwisle stated that, in the health chapter (Chapter 3), assumptions are made about baseline, particularly in the discussion of heat-related mortalities. In the report, it shows that mortality in Boston will improve with climate change. She believes that some commentary is needed when presenting this kind of data.

Dr. Rosa believes that visual displays such as diagrams would be a good way to communicate some of the information. Dr. Frumkin noted that some diagrams in the report should be redone. For example, Figure 6 of Chapter 3 (“Summary of Relative Direction, Magnitude and Certainty of Health Impacts”) fails to show the relative importance of impacts. Figure 8 of Chapter 3 (“Ozone Air Quality, 1990-2005”) is not useful because the scale is too large. By averaging effects over the nation, a flat line results over time, while local variability is much more dramatic. Dr. Pulwarty also noted the lack of linkage between local climate and local effects in the report.

Dr. Pulwarty noted that, in reporting the data limitations, it is important to describe exactly what data are needed.

There was some discussion regarding the need to create a center for adaptation. Dr. Pulwarty noted that a number of existing agencies are charged with protecting the public, including CDC, the weather service, and EPA, and not enough support is given for the recommendation of creating a new agency to address the problem. Dr. Patz and Dr. Pulwarty noted that it may be worthwhile to include specific recommendations for individual federal agencies. Dr. Patz and

Dr. Dietz suggested that CDC have the lead role. However, Drs. Entwisle, Patz, and Frumkin agree that the scope of the problem is too large for any single agency to handle and would require a number of federal environmental programs coming together. Dr. Frumkin believes that the nation's health agencies have, up to now, not addressed the climate change issue. Dr. Dietz noted that, given the lack of expertise of the panel, it would be presumptuous to recommend tasks for specific agencies. He suggested that the panel make general recommendations regarding the need for certain federal agencies to play an active role, including NIH, CDC, and EPA.

Dr. Pulwarty did not like how Figure 7 of Chapter 3 mixes together physical and social risks. He believes it would be better to divide the table into the two categories.

Dr. Dietz noted that there are statistical methods that allow determination of causation as well as the limits of effects, even when only imperfect data are available. He believes there should be some discussion about this topic in the report.

Dr. Dietz believes that the report does not adequately distinguish between the terms "lack of significant effect" and "no effect."

2.2.3. Charge Question: Do the Introductory Chapter (Chapter 1) and the Summary Chapter (Chapter 2) accurately and adequately describe the background issues related to the characterization of global change on human dimensions?

Dr. Dietz stated that the tone used in Chapters 1 and 2 is very different from the tone of Chapters 3, 4, and 5. The contradiction in tone leads to a contradiction in the message being sent.

Dr. Patz believes there should be more connection between the text and the conclusions of the chapters.

Dr. Frumkin noted that Table ES.1 from the executive summary ("Impacts of Climate Variability and Change on Human Health, Human Settlements, and Human Welfare in the United States") and Table 1 in Chapter 2 ("Current and projected climate change impacts and interaction with non-climate stressors") both summarize health impacts but do not correspond as well with each other as they should. The terms used in these tables are different, and major items like vector-borne diseases are missing.

Dr. Frumkin believes that there needs to be a health summary in all chapters. The more important health impacts need to be emphasized over the less important impacts.

Dr. Dietz stated that there are lengthy discussions that are not connected with the rest of the text (e.g., the discussion about migration). The tone and disconnect imply that certain factors are exogenous and should not influence policy decisions. This should be fixed.

Dr. Dietz noted that the normal iterative process of writing/review was not followed in the creation of this report. Some explanation of why this was not done needs to be included.

Dr. Frumkin called attention to the bulleted list on page 8 in Chapter 2 that summarizes the impacts on human health. He noted that the list is meant to be a complete catalog of health impacts, but it is not. In addition, line 22 suggests that health impacts are likely to be protected by the response capacity of the public health infrastructure, but this should not be the central

message. Rather, the message should be that climate change affects health, that there are many things we can do to mitigate the impacts and that many of the adaptation strategies are good for other reasons as well.

Drs. Patz and Frumkin noted that, throughout the report, exposures and outcomes are mixed together. They need to be categorized appropriately.

Dr. Patz believes there is an overemphasis in the text on demographic impacts. Other impacts are hard to quantify, and it would be unreasonable to properly assess the scenarios until more research is performed. Nevertheless, some consideration of the other factors should be made. Dr. Dietz agreed that the discussion of demographic factors should not be included while discussion of other impacts is missing. Drs. Dietz and Frumkin agreed that research into scenario approaches for other impacts would be useful. Dr. Entwisle defended the discussion on demographic factors, noting that background demographic factors are as relevant to human settlement as factors like technological change. However, she also noted that it would be appropriate to highlight the weakness of data for other factors.

Dr. Pulwarty believes that some discussion should be included regarding changes in adaptation strategies as impacts evolve over time.

Dr. Rosa stated that uncertainty would be better expressed as numerical values. Dr. Gamble acknowledged that the terms used in the report were not as consistent as they should be. Dr. Stonich noted that the likelihood scale used was not the same as that used in the IPCC report. Dr. Patz stated that the likelihood terminology presented in Table 1 of Chapter 1 (“Defining the likelihood of an outcome where it can be estimated probabilistically”) should be reduced to 5 or 7 terms instead of 10. People have a difficult time grasping classification schemes with more than 7 different groupings.

Dr. Rosa noted that Chapter 2 was mislabeled--the scope is not as broad as ‘human dimensions of climate change’. For example, the chapter does not include institutional issues that go into the human dimensions.

Dr. Dietz suggested that Chapters 1 and 2 emphasize the importance of further research. He noted that billions of dollars could be wasted if climate change is not properly accounted for in infrastructure planning.

Dr. Frumkin questioned the need for two introductory chapters (Chapters 1 and 2). Dr. Gamble noted that the intention was to provide a more readable overview. The executive summary was required to be 10 pages or fewer. Chapter 2 was a response to EPA comments, which asked the authors to describe what they believed to be important. She stated that the tone used in the introductory chapters is one that frames the issues in broad strokes, though she realized that the advisory panel sees the tone as problematic. Dr. Frumkin believes that a trim, succinct introduction would be better.

Dr. Gamble solicited comments about the call-out boxes used in the report. Dr. Frumkin stated his approval, but noted that some of the call-out boxes are disconnected from the text in the report. For example, there is a box discussing the issue of mental health, but no mention of the issue in the main report text.

Drs. Dietz, Entwisle, and Patz believe that a concluding chapter would be useful. Such a chapter would help the report reach the target audiences. Dr. Gamble noted that the original structure of the report included such a chapter. Dr. Patz suggested that Chapter 2 be removed, and that content from Chapter 2 be split between Chapter 1 and the concluding chapter.

Dr. Pulwarty thinks that the climate and health issues are well represented, but human welfare is not accurately characterized. Dr. Stonich believes that there needs to be a better definition of “well-being”, a definition which is distinct from “welfare”. The authors should use the same terminology used in other documents such as the IPCC report. That would help reduce the amount of text in this report. Dr. Frumkin believes that the discussion of human welfare represents an opportunity to tie together all the pieces of the report under the banner of “human impacts.”

Dr. Frumkin noted the lack of discussion of allergies, food security, and mental health in the health chapter.

Drs. Entwisle and Stonich suggested that perhaps the economic perspective is too strong in the report. Dr. Stonich believes that a section on the long-term effects on well-being should be included—a topic that is beyond the scope of monetary valuation. Dr. Rosa noted that the literature on the topic does not show definitive conclusions, and that any attempt to clarify the issue may cause problems. Dr. Frumkin suggested looking into the emerging science of happiness (hedonic psychology). Dr. Dietz noted that welfare economics have an explicit normative theory. In contrast, psychology includes topics where normative content is difficult to determine. There ought to be at least a paragraph of text that cautions readers about the use of these kinds of indicators. Dr. Rosa also noted the difficulty of measuring satisfaction and determining a baseline set of feelings that people have. Dr. Frumkin suggested that this topic would be better addressed via call-out boxes.

2.2.4. Charge Question: Does the Committee find that recommendations for adaptation strategies and for ongoing study are adequately supported by the evidence, analysis, and sound science?

Dr. Entwisle noted that the likelihood categories used in Table 1 of Chapter 1 do not make much sense in terms of social science. There is a lot of distinction been made at the very top and the very bottom of the scale. Dr. Stonich indicated that if it is decided to use this kind of scale then 7 categories is the most that social scientists have found make sense for people. If it is possible for some conclusions to come to a finer resolution and finer probabilities, then it is okay to use those finer quantitative data. Dr. Rosa noted that it seems that there are two separate issues: 1) how to best convey the degree of what you think a risk is going to happen (using a scale of likelihood), and 2) what is the extent to which they can look at separate categories. He also noted that asking people about subjective aspects may require a different scale. Dr. Stonich indicated that the IPCC chose to use 10 categories rather than 7, which is what Working Groups II and III use. Working Group I (biophysical group) chose to include 3 more categories in order to designate a greater degree of precision for each of the categories. She suggested that Table 1 should be consistent with the IPCC II report, which is the one most relevant to this EPA report. Dr. Dietz asked the group if there was consensus to modify Table 1 based on the categories used by Working Group II. Dr. Patz agreed that, at a minimum, the table should be consistent with Working Group II and use 7 categories, perhaps cutting back more to those that are easier to

quantify. Dr. Rosa noted that the group is in agreement that this is a useful thing to have in the report, though fewer categories would be better.

Dr. Frumkin stated that it is also important to clearly explain how the probabilities were assigned. It might be more robust if the explanation was more than just the authors' opinions, or at the very least if it is stated how the authors made the decisions. He noted that there are a few assignments of probabilities that do not seem to make sense at all; reasonable people can disagree about these assignments. In these cases, it may be better to avoid making assignments of probabilities, as it detracts from the credibility of the report. Dr. Gamble noted that expert judgment by the authors was used for assignment of probabilities. She noted that if we have categorization, it is important that it is understandable, consistently applied and that it is something that can be taken forward in terms of how it helps us understand adaptation options.

Dr. Patz noted that there is a wide gap between getting to conclusions throughout the categories, and this is an expert judgment exercise that reflects the opinions of the authors. It would be useful to have a few paragraphs indicating that these conclusions are not just one person's opinion but the result of a full review by a team of experts. Even though there are not a lot of quantified findings, some transparency of process would be helpful, especially because this document will be used by policy makers and agencies looking at funding issues. Dr. Gamble noted that it is a messy process; it is not fine science. Dr. Patz stated that it is important to make sure that the document fairly describes what the authors' process has been in reaching their conclusions.

Dr. Dietz indicated that it is probably too late for this process, but there is good methodological guidance available for expert elicitation. He suggested that the rows include the important impacts issues for which it is impossible to estimate a probability density function. It is important to highlight the research needs. Also, the tables need a column that highlights the expert judgment/state of knowledge used.

Dr. Rosa noted that in Figure 1.3 (Chapter 1, page 15), it might be a good idea to add an extra column to describe the rationale for these probabilities. It leaves the authors space to mention research opportunities.

Dr. Patz asked whether it is really too late to apply to this document some of the processes referred to by Dr. Dietz. He noted that there does not seem to be any discussion of likelihood in the health chapters. Dr. Dietz noted that some of these processes are not time-consuming; however, the issue is whether there is someone that has the necessary expertise to determine the best way to do this given the time frame. He noted that getting the expertise to do this is more time consuming than actually doing it.

Dr. Frumkin noted that none of the designations presented in Chapter 2, page 8 of 21 are supported by evidence. It is not known how the experts came up with these designations.

Dr. Dietz noted that there are places in the report where the literature still needs to be reviewed. He asked whether it would be best not to include the tables if they cannot be fixed to the standards that the group is talking about. Dr. Frumkin noted that that may be an option. Also, the entries for which there is not enough data could be flagged. He also noted that it would be good to include a table of priority research needs, which would give suggestions about where

research needs ought to be focused. It could be organized by agencies who would be interested in more research.

Dr. Dietz indicated that he worries a bit about the authors of this report setting the research priorities. An assessment should be done by analysis and deliberation, and the only ones doing deliberation are all scientists. He suggested that the authors say, “here are the things we could not address, because we didn’t have the research.” Dietz also noted that there is a tendency to say things based on common sense without finding sources. The authors need to be careful about statements on capacity for adaptation. There is a lack of studies that show the variation in ability to adapt to climate change as opposed to other factors. A logical policy analysis would compare adaptation and mitigation strategies; this report only includes adaptation. He noted that the case is reasonably well made in Chapter 3, but not in Chapter 2. It is a matter of tone, rather than an explicit statement of wrong conclusions. Dr. Pulwarty added that we need to be able to state clearly the fraction attributable to risk.

Dr. Patz noted that in Chapter 3 a sub-header could be added to address mitigators and co-benefits. For example, if the urban heat island effect is reduced by turning roads to bike trails, should the health benefits be considered? He asked whether this should be part of the report. Dr. Gamble noted that it may be worth mentioning this issue, but given the time constraints she is not sure how good a job they can do. Dr. Patz noted that we are reading this document as an assessment, but actually it is much more important to say what we don’t know and have a road map for research.

Dr. Frumkin suggested creating a box titled “mitigators and co-benefits”. The focus should be on climate change and human health, not climate change and the responses of human health. He noted that we need to flag and elevate this as an important issue, but do not do the analysis right now. Dr. Pulwarty suggested that this be framed as gaps in knowledge.

Dr. Patz noted that the National Assessment listed research gaps and EPA provided funding to address these research gaps. Dr. Entwisle indicated that we don’t have an adequate benchmark to make comparisons; we need to create a benchmark or look at past benchmarks. Dr. Pulwarty stated that we can not propose more work if we can’t say how well past work has been done.

Dr. Rosa stated that there is a companion report mandated in the CCSP for the development of metrics for assessing the state of science. This document might provide a good framework for developing benchmarks. . Dr. Pulwarty noted that it is important to add some level of oversight since adoption could mean doing the wrong thing better.

2.2.5. Charge Question: Are the advantages and disadvantages of various adaptation options, including the status quo, adequately considered and examined?

Dr. Frumkin noted that the discussion on adaptation options is very truncated. He stated that discussing adaptation options should be done right or not done at all. Dr. Frumkin also indicated that fulfilling the report’s immediate charge (i.e., analysis of human health effects) is a different thing than doing an analysis of adaptation options.

Dr. Gamble noted that the first national assessment was focused on impacts and research gaps, and to a lesser degree on adaptation options. She indicated that a discussion of adaptation options would be a meaningful contribution that has not been made at this scale. It was the

authors' intention to provide something meaningful to the end user through the sections on adaptations.

Dr. Frumkin noted that the new recommendations/conclusion chapter could also summarize adaptation in addition to research needs. It may not be a complete summary of adaptation but it can provide useful examples; even just setting up an avenue of inquiry would be useful. Dr. Dietz agreed with this suggestion and added that the NRC report "New Tools for Environmental Protection" could provide good examples.

Dr. Stonich noted that attention should be paid to the fact that there are tradeoffs and costs. There are risks and benefits associated with adaptation strategies and those reading the report need to assess these risks and benefits.

Dr. Patz stated that the discussion on adaptation should be framed as sustainable adaptation.

Dr. Gamble noted that the authors had intended to address the issue of generational equality.

Dr. Dietz suggested that the chapter be structured in a way that it provides examples of issues worth looking at when considering adaptation. The next generation could help close gaps.

Dr. Pulwarty noted that there are institutional issues related to adaptation; this is a knowledge gap. It is important that adaptation suggestions be more practicable than a suggestion like "move away from coastal areas."

Dr. Stonich indicated that there is literature that distinguishes between coping strategies and adaptive strategies.

Dr. Patz noted that there are two levels that should be considered: a strategic plan and an implementation plan, the latter of which cannot be done without more experts.

Dr. Entwisle asked whether there is a monitoring component that should be covered. She noted that to have the kind of information at the scale that is needed requires a lot of monitoring.

Dr. Frumkin noted that the CDC has done a lot of thinking about what needs to happen to the core functions of public health. These things include surveillance, communications, research, and developing and implementing plans. There is a whole list of these things that together comprise the conversation on how to respond to climate change. This is a big issue and it may be beyond the scope of the report. He suggested that, in the closing chapter, it be stated that this report is mostly about the impact of climate change on health and that the appropriate responses need to be the subject of supporting work. Dr. Frumkin also noted that there is a \$25 million/year project at CDC called Environmental Public Health Traffic? to get databases talking to each other and to track how we are doing with regards to public health. The database incorporates global climate change. This is a national effort that will be made more regional overtime. EPA's report on the environment and other efforts at the national level to collect available data are potentially useful sources.

Dr. Pulwarty noted that there is the question of how to generate effective risk scenarios. For health, as one moves from extremes of variability, it is important not only to include monitoring but also to define what it means to generate effective risk scenarios.

2.3. Chapter Comments

Dr. Dietz asked panel members to provide comments on specific sections of the report.

2.3.1. Executive Summary

Dr. Patz noted that it is important that this document be comprehensive by noting the interrelationships among different issues. Even though the report does not have to cover everything, it is important to think comprehensively about these issues.

Dr. Rosa noted that a persistent problem throughout the report is that transitions between sections are not clear. Sometimes, tables come out of nowhere. It would be useful to have a small transition or summary of what is about to follow in the table format.

Dr. Dietz referred back to previous discussion about adding an evidence column to Table ES.1. It would also be helpful to cite specific places in subsequent chapters where impacts in Table ES.1 are discussed or find some nice language that says this is speculative. If there is no strong evidence for a particular impact, it does not mean it is not an issue.

Dr. Frumkin added that a column on the strength of the evidence and on the possible magnitude/effect is also needed in Table ES.1. There needs to be a catalog of health impacts that lists the important things first and it needs to be repeated at each place where we are going through the health impacts. There needs to be a complete listing of health impacts. Pre-traumatic impacts, for example, need to be described.

Dr. Entwisle noted that the Table ES.1 should be tied into the substance of the chapter. Specific page references where these things are discussed are a great idea. She noted that one thing missing in impacts is that people may move away from these places and that policy may be made to encourage that move. She wanted to see tighter connections with what is in the chapter.

Dr. Frumkin indicated that Figure ES.1 is not useful unless the metric is identified. He suggested removing this figure from the report.

Dr. Frumkin added that Table ES.2 on page 10 makes a good point that vulnerabilities differentiate regionally. However, there is a question of why these were chosen and others excluded. The urban heat island is not appropriate to map regionally. He added that the icons are great; additional ones such as floods and mosquito could be added and carried throughout the entire report. He also suggested that level of intensity be incorporated and represented by one to three check marks. Dr. Entwisle noted that the figure addresses the issue of micro-level variability; however, it is missing both sides of the spatial scale. Dr. Stonich added that if the figure is included there needs to be a note that climate impacts appear different at particular scales. Dr. Patz noted that this diagram begs the question of how much crosswalk was done with the IPCC assessment. The North American chapter has graphs zeroing in on different regions that might be quite useful.

2.3.2. Chapter 1

Dr. Rosa asked why the IPCC Fourth Assessment Report is not cited. Dr. Gamble noted that the Fourth Assessment Report was not available at the time the drafting process for this report began. The intention is to reference the Fourth Assessment Report if it provides the appropriate

material. Dr. Stonich noted that there are some references to the Fourth Assessment Report; there needs to be consistency across all chapters on this.

Dr. Rosa noted that Section 1.2 should address mitigation issues.

Dr. Dietz noted that Section 1.3 should be framed in a way such that demographics do not appear more important than other factors that are not given as much page space. Dr. Frumkin noted that the discussion gives the impression that climate change issues are compounded in metropolitan areas. There needs to be discussion on how congestion is, in a way, preferable to sprawl. This is not a static situation because green cities are changing how we look at this.

Dr. Stonich asked whether section 1.4 would be a good place to include a discussion of research methods. Dr. Dietz noted the section should discuss how we are going to report uncertainty and how we came to these assessments. Dr. Rosa noted that the uncertainty is embedded in a lot of issues. Dr. Entwisle suggested using the working group 2 table instead of the working group 1 table.

2.3.3. Chapter 2

Dr. Dietz suggested that part of Chapter 2 go into Chapter 1 and part become a final chapter of conclusions and recommendations.

Dr. Rosa noted that the title of the chapter is much more comprehensive than what the chapter actually covers.

Dr. Entwisle stated that the sixth item in Table 2 about mortality increases due to heat waves is the kind of statement that needs some kind of baseline of comparison. Dr. Frumkin noted that the table should be removed. This is too nuanced a topic to encapsulate in a table. The table takes complex statements and simplifies them. Because of the nature of the statements here, likelihood estimates could not be supported. Topics listed in the table should be in the report not in table format. Tables are good for showing lists of similar items, but not for showing dissimilar statements that are different in scope and orientation.

Dr. Frumkin noted that the opening statement in Section 2.2 means to say “other trends in addition to climate trends will be important in coming years”. But the way it is presented, it seems to minimize the climate change issue.

Dr. Dietz noted that it is important to differentiate between elasticity and plasticity. Some things have a big impact when they change (high elasticity). From a policy/mitigation/adaptation perspective, some are easy to change (high plasticity). *Citation: R. York et al.. 2002. "Bridging Environmental Science with Environmental Policy: Plasticity of Population, Affluence and Technology." Social Science Quarterly 83:18-34.*

Dr. Entwisle noted that the statement about immigrants as vector of disease is concerning; our own population and travelers are just as likely to become vectors. Dr. Patz added that this statement is deceptive. As climate change is a global phenomenon, it could bring more diseases in. What happens around the rest of the world can affect us.

Dr. Frumkin noted that on page 14, line 24 it is stated that “while we anticipate American will be only marginally affected by climate change, we conclude that some portion of the population and

some places where people live and work will be seriously and disproportionately impacted.” The message in this statement seems to be “we’re basically going to be ok.” Dr. Dietz added that the report needs to be more judicious about what the evidence actually says.

Dr. Gamble asked whether, if this chapter goes away, there is a place for the case study boxes. Dr. Patz and Dr. Stonich agreed that the case study boxes could be moved to some other sections of the report.

Dr. Stonich added that Table 2.3 needs to be revised in light of recommendations for Chapter 5.

Dr. Frumkin noted that lines 35-46 on page 16 are meant to be a summary of the way communities have been designed. However, this discussion needs more work. A more balanced discussion of sprawl since WWII and what has been learned about sprawl could be helpful. Discussion of the benefits and costs of sprawl, and changes in the coming decades, would be useful.

Regarding Section 2.3, Dr. Rosa noted that there is no clear demarcation between concepts. Some of the actions could be judged to be mitigation efforts rather than adaptation. It hints at sensitivity to what we call social factors that contribute to resiliency.

Dr. Dietz noted that the strategies for adaptation presented on page 18 are not grounded in reality., given the fairly extensive failures witnessed in recent years, especially with Hurricanes Rita and Katrina in 2005.

2.3.4. Chapter 3

Dr. Entwisle noted that the discussion on the first paragraph about cause and effect chains should also mention community organization. She added that the Chicago heat wave study is a well-known study that looks at the effects of the heat wave and takes into account community organization factors. She also noted that, while the Chicago study does a great job, it does not consider spatial variability of temperature within Chicago.

Dr. Frumkin noted that in terms of organization, the chapter needs to follow the health impacts order used in other chapters. He also added that the geographic locations of vulnerable populations differ. He also noted that discussion on tornados and hurricanes is missing from this chapter. There needs to be an infectious disease section and a mental health section. Dr. Frumkin noted that, for heat-related mortality, there are no mortality data to support quantitative discussion. For each health impact discussed, a statement should be made regarding why the impact is considered climate-related. Dr. Patz noted that IPCC, rather than predicting the influence of climate change on pathogens, looked instead at current sensitivity to determine the effect of climate change, so it is not unreasonable for this report do similarly.

Dr. Frumkin noted that there is a lot of information about air quality projections, in more detail than what is needed in this report.

Dr. Frumkin noted that the discussion on vulnerable subpopulations (page 25) should be its own section. He also noted that there are important research needs and data gaps missing from page 29. The list is too long; it would be more useful to combine and rank items. Issues such as communication strategies, mental health, and food security need to be included. A section on climate variability would be good. On page 31, there is little need for that diagram and therefore,

it should be removed. On page 32, line 36, it is basically stated that climate change is basically a risk-management issue; this does not seem right. The diagram on page 34 (Figure 7) commingles different concepts and is not useful at all.

Dr. Stonich asked for clarification on the category of race. It appears that the terms “impoverished” and “low socioeconomic status” are sometimes used as synonyms. This usage is incorrect.

Dr. Patz noted that on page 32 there should be a new section in mitigation. He also asked Dr. Frumkin if the framework for adaptation (page 33) may benefit from using the “10 essential services of public health” used by CDC. Dr. Frumkin will look into this issue.

2.3.5. Chapter 4

Dr. Patz indicated that this chapter is not as well referenced as the other chapters. There are too many speculative statements. Dr. Entwisle noted that it is important to look across scale, both locally and regionally.

Regarding Section 4.2 and the issue of sea level rise, Dr. Dietz noted that the standard projection for the Great Lakes is a drop in level. There is concern that this may expose a lot of toxic sediments to erosion. He also noted that there is a study looking at the vulnerability to storm surge. (CIESIN presented at the Population Association of America last year.)

Dr. Entwisle indicated that it is not clear what the focus of the table on page 33 is. Dr. Gamble agreed with Dr. Entwisle’s comment.

Dr. Patz noted that in Section 4.3, page 14, there are no references and it seems that the statements are pure speculation.

Dr. Dietz stated that on page 50 the relationship to the GCM runs needs to be mentioned. He also noted that almost every other assessment has been based on these kind of GCM runs. It needs to be clear that these are just examples to show what things might look like.

Dr. Patz noted that discussion on co-benefits can be included in Chapter 4. He also stated that Appendix 1 is nice but very redundant.

Dr. Frumkin noted that there is no much information included related to the smaller scale of human settlements such as buildings. He suggested that information be included regarding benefits of green buildings.

Dr. Frumkin also asked why the maps on page 15 show the heat wave to be more pronounced in the southern regions when cities most at risk are those along the northern tier. Dr. Gamble noted that it has to do with capacity for response. Dr. Ebi indicated that it has to do with physiology and also infrastructure.

3. DAY 2 -

3.1. General Comments

3.1.1. Research Recommendations

Dr. Entwisle suggested that since this chapter is directed towards a broad, general audience, the research recommendations in Chapter 2 (intended for the research community) should be moved into a new final chapter. She also suggested that it would be useful to collect recommendations that are common across the chapters in to this final chapter.

Dr. Rosa stated that, whatever form the list of research recommendations eventually takes, it should also go into the Executive Summary as well. He believes that the recommendations are the punch line to the report.

Dr. Frumkin pointed out that the few adaptation recommendations in the report are a ‘half effort’, and that it should be done right or not at all. Adaptation approaches should not be included because that would be beyond the scope of the report. Rather, the author’s should stay focused on the main goal – presenting the current state of knowledge, and not attempt to say how to cope with climate change.

Dr. Pulwarty added that if the report were to focus on only a few recommendations then they would be opening themselves up to criticism. He stated that the report needs to be more consistent by consolidating the research recommendations available and by clearly stating that that the recommendations presented were not comprehensive. Dr. Dietz disagreed slightly. He suggested that, if the authors collect good examples of response strategies, they should be emphasized, while also giving cover to themselves by explaining why they did not go into more detail. He sees a need to mix analysis and stakeholder deliberation in order to make recommendations detailed, and report didn’t do that.

3.1.2. Adaptive Strategies

Dr. Pulwarty pointed out that the report contains a list of adaptive strategies with no examples outside of the US. The report needs an example under each adaptive strategy.

Dr. Dietz added that, in addition to these examples, the report should point out that there is a fair amount of scholarship done on the diversity of ways to develop policy responses. He asserted that there is a whole repertoire of approaches to use in developing adaptive strategy.

Dr. Pulwarty added that there are a set of tools to include that should be recommended for testing in the context of health, but not for use outright.

3.1.3. Chapter 2 Reorganization

Dr. Gamble posed the question as to whether Chapter 2 should be redone or thrown out completely. Her suggestion is to take the examples from that chapter and put them in where they fit in the three topic chapters.

Dr. Frumkin believed that a split between two chapters of the background information (Chapters 1 and 2) is undesirable, and added that a nice background chapter that is comprehensive can also include boxes (examples). He added that the adaptation issue outlined on pages 64-68 is qualitatively different from the rest of the report because there is very little evidence for it.

Pointing out data gaps in this report is very important. The section on adaptation measures does not have the same high standard of evidence seen elsewhere in the report. Dr. Pulwarty agreed with Dr. Frumkin but added that this is a different type of problem from assessing impacts. There is a great uncertainty regarding benefits of adaptation practices, and there is a reason why we could be more certain about the accumulation of all the previous comments. Responses that are engineering in nature appear to be the better method than just telling people what they ought to do.

3.1.4. Planning a Written response to the Charge Questions

The expert panel spent part of the second day drafting a memo summarizing their major recommendations. The memo, which will be sent to the writing committee, was produced to give the writing committee the ability to start their revisions as soon as possible. The expert panel came up with the following list of key issues:

- Voices unrepresented in the document.
- Lack of deliberation.
- Discussion regarding the global aspect of climate change.
- Demographic impacts favored and other impacts not covered at the same level.
- Include other vulnerable groups not mentioned - race class and gender social categories.
- Key concepts and terms defined and presented up front.
- Bringing in co-benefits.
- More balanced treatment of negative as well as positive impacts.
- The repeated statements that other factors are more important than climate change.
- Differential impacts.
- Looking at the United States in a larger context.
- Paying attention to the IPCC recent reports and the Millennium Ecosystem assessment.
- Use of wellbeing rather than welfare, and distinct between these terms and 'quality of life'.
- This issue of adaptation and mitigation.
- Clear distinctions concerning the data limitations.
- Use of language more carefully chosen.
- More integration and synthesis among chapters 3, 4, and 5.
- Interconnections with non-climatic factors.
- Defining categories and scope of wellbeing that the report doesn't cover.
- Emphasis forces and other terms that will affect wellbeing in the future.
- Catalog other things besides climate change that will be happening.
- Coordinate the use of concepts throughout the document.
- Be clear about the different between physical and social vulnerabilities.
- Comment on the use usability of the document for the scientific and public health communities.
- Concept of vulnerability, more complex than social and physical (suggests they should cite Dr. Dietz's paper that is in press).
- Linking prevention and early warning (these two things are so embedded in the health question that you can't just have a box on them).
- The mixing of the role of adaptation and prevention.

- Linking prevention and early warning, since those two are so embedded in the health question.

3.1.5. Reorganization of Chapters 3, 4, and 5

Dr Stonich stated that Chapter 5 brings up the concept of social capital for the first time in the report; therefore, a discussion of other community forms of capital should be moved to there.

Dr. Rosa added that resiliency factors that reside in the forms of community and social capital need to be mentioned. Also, he disagreed with how mitigation is brought in the report because it impacts the framing, which should be congruent with the 4 components stated in the beginning of the report.

Dr. Pulwarty asks the committee if they think the attribution piece should be included as an overarching issue. Dr. Dietz believes that it is over-arching.

Dr. Entwisle stated that she thinks that there needs to be more discussion on the methodology for the assignment of probabilities. Also, she pointed out a degree of overlap between chapters 3 and 5. ‘Settlement’ is completely different from ‘wellbeing’ and ‘health’, not a subcategory. The latter two issues can be attributable to individuals (e.g., whether an individual is happy or sad, sick or healthy). Settlement is not like this. Dr. Dietz suggested that the best way to deal with the issue of settlement might be to put this chapter first out of the three substantive chapters. Dr. Gamble stated that the health chapter was placed first because the evidence base was stronger for health.

Dr. Frumkin stated that the report needs to lay out the whole concept of human impacts. He liked the idea of moving chapter 5 to be the first of the three substantive chapters, and to including the subject of human well-being (including happiness). Dr Entwisle stated that she is not sure how the committee is going to agree on how the report should be reorganized, and she is not sure that they need to. Specific recommendations such as this can be made in each member’s specific comments. Dr. Dietz agrees, suggesting that one could suggest one or two different models in just a couple of sentences.

Dr. Stonich agreed with Dr. Frumkin, but also added that, if Chapter 5 stays at the end, it could be used as a good introduction to the conclusion chapter and help present wellbeing as a broader concept.

Previous discussion from the expert panel had focused on the 10 categories of uncertainty being used, which were modeled after those used by IPCC Working Group 1. Dr. Dietz suggested an alternative way to handle uncertainty: including a column for ‘state of science’ and a column for ‘magnitude’.

3.1.6. Issues with other bullet points/questions that the Panel compiled

Dr. Dietz suggested that a final chapter to the report could include a bulleted list of research recommendations.

Dr. Frumkin stated that the research recommendations that are embedded throughout the three topic chapters should be moved whole cloth into a research recommendations chapter. He added that there are still important research needs that should to be addressed in addition to these. Dr.

Dietz argued in favor of redundancy, thus leaving the identified research needs in the substantive chapters and also restating them in the final chapter. He thought that there needs to be a statement in the report saying that “the list of recommendations is by no means exhaustive”.

Dr. Frumkin requested that the committee add a summary recommendation on communication. Dr. Pulwarty disagreed, saying that communication should be embedded in a strategy for adaptation if it is going to be recommended. He pointed out that the scope of how decisions are actually made is beyond the scope of the report, and that the report is not a stand alone piece.

Dr. Dietz stated that the draft report should try to replicate the historical climate change reports.

Dr. Dietz suggested that the committee attempt to integrate their thinking on the discussions of adaptation strategies, communication and adaptive deliberation. He stated that, when you support something with scientific literature, it doesn't require much deliberation. Thus, if you are summarizing the literature but not making recommendations then it should be appropriate. Dr. Rosa agreed, and noted that the assessment of the deliberative strategy should be something that is pointed out for needing further research. Dr. Pulwarty agreed that the report should not be recommending a strategy, and should be honest about what information is being conveyed.

3.1.7. Chapter 5

Dr. Stonich stated that there is a narrow focus in the entire chapter on the impacts of climate change on human welfare. A number of new concepts appear in Chapter 5 that do not appear in other chapters. This chapter does not directly address the questions of the SAP. She was uncomfortable with the use of the terms ‘welfare’, ‘wellbeing’ and ‘quality of life’. She stated that, if the economic approach is essential in this chapter, then she would recommend other economic approaches, such as an ecological economic approach.

Dr. Frumkin believed that the section on human welfare/quality of life sets a good framework, but that the human health section is unnecessary because it could be covered in the human health chapter. This may cause an inconsistency in the report with health being treated in two separate ways. The topic of ecosystems services is not important, since it is covered in other SAPs. However, recreational assets are important to describe. He suggested that the chapter be called ‘recreation’. The chapter would be unique from all other chapters and would give more parallelism across the entire report. Dr. Dietz stated that he would prefer that there be redundancy in the report over having an important topic be overlooked.

Dr. Frumkin stated that the economics is necessary but that it overly dominates the chapter. Dr. Dietz stated that macroeconomic literature describing the welfare effects of mitigation is missing from the report. He also noted that some topics are easily monetized in economic studies (such as public health impacts), while others are not (such as ecosystem impacts). This chapter erroneously assumes that the reader needs a tutorial on how to perform an economic evaluation. The logic of the chapter is contorted. Dr. Rosa stated that the authors can follow the expert panel's memo, keep Chapter 5 as it is now, and resolve this problem with only a small effort.

Dr. Dietz stated that the conclusion being made by Chapter 5 are the examples of assessments of economic welfare aspects, and this justifies why the report is looking at well-being. He suggested ‘well-being’ as the frame for this chapter, and the discussion about economic welfare as a subset to this. He says that because there are examples here of adaptation strategies and of how evaluation methods for economic welfare can be applied, we should condense the first part of the

chapter on other approaches. We need to acknowledge that we can make larger statements about health effects than we can about economic impacts. There is also this issue of the macroeconomics of mitigation. Dr. Gamble reminds the committee to put as much of this as they can into writing. Dr. Rosa comments that Dr. Dietz has articulated a larger issue in the report – the conflict between what counts and what is countable. Dr. Pulwarty agrees that making references to economic studies and pointing to methodology is import.

Dr. Pulwarty asked the committee if they are in agreement with regards to the adjustment suggestions for Chapter 5. Dr. Rosa asserted that, if they are going to be following the redundancy model, then Chapter 5 should be kept and tweaked a bit. Dr. Dietz envisioned Chapter 5 containing a set of emerging economic measures and alternate measures for looking at well-being. Dr. Gamble stated that she is prepared to move chapters.

Dr. Entwisle stated that there is not one best way to organize the report. Dr. Frumkin agreed, and then offered the following suggestions for organizing the report:

- Begin with an introductory discussion of human wellbeing, including psychological, health, prosperity, assets such as mobility, recreational facilities, etc.
- State that some of the issues are addressed in other SAP reports
- Discuss how your well-being can be measured.

This would cause Chapter 5 to disappear, although the recreation section should be kept, perhaps as its own chapter.

Dr. Gamble stated that she wants the recommendations suggested on the record. Dr. Frumkin noted that this is a design problem in the whole climate change arena that CCSP is tackling. Dr. Dietz believed that, in the opening paragraph of the document (produced by the committee) there needs to be mention that, based on the state of science, this is the appropriate way to structure this type of analysis.

Dr. Entwisle pointed out an integrated conceptual framework would make it possible to select what chapters should be included in this report. Dr. Frumkin stated that, out of the 21 products for the SAP, it is interesting that human impacts is only one of them. He thinks makes sense for the committee to say that we are providing specific feedback as their duty, but also to state the problem that the consideration of human dimensions has been constricted for some time. He thinks that the committee should recommend an expansion of this arena over time. Dr. Dietz points out that the committee is in agreement that human dimensions are under funded and often trotted out to justify research programs (and even then not given enough money). Clearly, it is difficult to do this report because there hasn't been enough research in human dimensions. He suggested that the report include the statement that for 20 years there hasn't been investment in this field. Dr. Gamble may pass this issue along as part of the committee document. However, Dr. Patz recommended not adding this message to the report itself, but rather in the introduction of the memo of summary recommendations.

Dr. Patz asked whether or not the likelihood tables in the report will be useful if the other 20 SAP products do not have similar tables. Dr. Rosa stated that, if none of the other SAP products contain similar tables, they may be of limited use. Dr. Entwisle recommended keeping them in because she believes that it's a communication issue – people need a summary. Dr. Dietz agreed

and added that many rows in the table come from solid sets of evidence. Also, the tables are helpful in pointing to sections of the report where the literature is reviewed.

Dr. Entwisle stated that the draft memo would be circulated amongst the expert panel. Dr. Gamble will distribute it, and revisions will be accepted within a week. During this time, the committee was encouraged to review their previously submitted written comments.

Closing remarks and thanks to the committee were given by Dr. Gamble, the committee chairs, and Dr. Slimak.

APPENDIX A: List of Attendees

Human Impacts of Climate Change Advisory Committee Meeting

List of Attendees

Hilton Alexandria Old Towne

October 15-16, 2007

Name	Affiliation
<i>Members of the HICCAC Expert Panel</i>	
Barbara Entwisle, Co-chair	UNC-CH
Susan Stonich	UCSB
Thomas Dietz, Chair	MSU
Roger Pulwarty	NOAA
Eugene Rosa	Wash. St. U
Howard Frumkin	CDC
Jonathan Patz	University of Wisconsin
<i>Invited Guests + EPA Personnel</i>	
Janet Gamble	EPA
Kristie Ebi	ESS, LLC
Joanna Foellmer	EPA
Peter Preuss	EPA
Colleen Reid	EPA
Michael Slimak	EPA
Teresa Leonardo	USAID
<i>Other Attendees</i>	
Patricia Wood	Versar
Pat Rizzuto	BNA
Gina Casciano	Versar
Ron Lee	Versar
Adria Diaz	Versar
Glen Kedzie	ATA
Malikah Moore	Versar
Adam Sarvana	Inside EPA

APPENDIX B: Agenda

Meeting Agenda for Human Impacts of Climate Change Advisory Committee (HICCAC)

U.S. Environmental Protection Agency
National Center for Environmental Assessment
Global Change Research Program

Monday, October 15, 2007 – 9:00 a.m. to 5:30 p.m. Eastern Time
Tuesday, October 16, 2007 – 9:00 a.m. to 3:00 p.m. Eastern Time

Location: Hilton Alexandria Old Town, King Street Station (Yellow and Blue Lines)

Purpose: Conduct a Peer Review of EPA's Draft Report: Synthesis and Assessment Product 4.6:
Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems

Monday, October 15, 2007

8:00 am	Registration	
9:00 am	Introductions	Peter Preuss Director, National Center for Environmental Assessment
9:10 am	Welcome and Opening by EPA	Joanna Foellmer Designated Federal Officer
9:15 am	Welcome by Chairs	Tom Dietz, Chair Barbara Entwisle, Co-Chair
9:20 am	Introduction of Panelists	Panel Members
9:25 am	Purpose of Meeting and CCSP Synthesis and Assessment Products	Janet Gamble Convening Lead Author
9:30 am	Initial ordering of charge questions	Panel Members
	▪ Self-select chapter experts to lead discussion by charge or by chapter ▪ "Triage" the charge questions: degree of convergence and/or convergence across the eight overarching charge questions	

10:30 am	BREAK	
10:45 am	Deliberation Session # 1 2 questions considered: (1) Select question a – h (2) Select remaining a – h	Panel Members
12:00 pm	Lunch	
1:30 pm	Deliberation Session # 2 2 questions considered: (3) Select remaining a – h (4) Select remaining a – h	Panel Members
3:00 pm	BREAK	
3:15 pm	Deliberation Session # 3 2 questions considered: (5) Select remaining question a – h (6) Select remaining question a – h	Panel Members
4:30 pm	OPTION: Public Comment based on request to DFO	
4:45 pm	Summary of Day 1 Day Two Plan	Tom Dietz / Barbara Entwisle
5:00 pm	ADJOURN	

Day Two, October 16, 2007

9:00 am	Expectations for Day Two Deliberations.	Tom Dietz, Chair
9:10 am	Deliberation Session # 4 2 questions considered: (7) Select remaining question a – h (8) Select remaining question a – h	Panel Members
10:45 am	BREAK	
11:00 am	Panel Wrap up Discussion: Revisit topics where significant discrepancies remain Sub-group panel discussions re: chapter strengths and weaknesses	
12:00 pm	Lunch	
1:00 pm	Final deliberations; homework assignments	Tom Dietz, Chair
2:45 pm	Wrap-up and next steps	Tom Dietz, Chair

2:55 pm

HICCAC time line

Janet Gamble / Joanna Foellmer

3:00 pm

Adjourn

APPENDIX C: Charge Questions

Reviewers were asked to address the following questions in formulating their comments and focusing their review of the draft report.

- a. Does the Committee agree that the report fairly represents an unbiased and accurate state of the science?
- b. Does the Committee find that the conclusions and recommendations set forth are adequately supported by evidence, analysis, and argument? Are uncertainties or incompleteness in the evidence explicitly recognized and addressed where appropriate?
- c. Does the Committee conclude that where recommendations are based on value judgments or expert opinion that adequate support is provided for those judgments?
- d. Does the Committee find that the advantages and disadvantages of various adaptation options, including the status quo, are adequately considered and examined?
- e. Does the Committee agree that the Executive Summary concisely and accurately describes the key findings and recommendations of the report? Is the Executive Summary consistent with findings from the remainder of the report?
- f. Does the Committee find that the Introductory Chapter (Chapter 1) and the Summary Chapter (Chapter 2) accurately and adequately describe the underlying or background issues related to the characterization of global change on human dimensions?
- g. Does the Committee agree that Chapters 3, 4, and 5 accurately describe the key findings and recommendations with respect to climate change impacts and adaptation on human health, human settlements, and human welfare?
- h. What other improvements does the Committee suggest?
 - Comment on the usefulness of the report to the scientific and public health communities, to resource managers, and to federal, state, and local officials.
 - Are there elements that should be added or removed, including: better examples (textual or graphic) that should be included or essential references that have been omitted?
 - What other significant improvements or major conclusions or themes should be addressed in the report?