CCSP Synthesis and Assessment Product 4.6

SAP-4.6

Prospectus for

Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems

U.S. Climate Change Science Program

Lead Agency
Environmental Protection Agency

Contributing Agencies
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Department of Health and Human Services
National Aeronautics and Space Administration
National Oceanic and Atmospheric Administration

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This prospectus has been prepared according to the *Guidelines for Producing Climate Change Science Program (CCSP) Synthesis and Assessment Products*. The prospectus was reviewed and approved by the CCSP Interagency Committee. The document describes the focus of this synthesis and assessment product, and the process that will be used to prepare it. The document does not express any regulatory policies of the United States or any of its agencies, or make any findings of fact that could serve as predicates for regulatory action.

Prospectus for Synthesis and Assessment Product 4.6

Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems

1. Overview: Description of Topics, Questions to be Addressed, and Audience

1.1. Description of Topics

The Strategic Plan of the U.S. Climate Change Science Program (CCSP) calls for the preparation of 21 synthesis and assessment products (SAPs) to support policymaking and adaptive management across a range of issues. Synthesis and Assessment Product 4.6 addresses the effects of global change on human health, human welfare, and human settlements. The impacts of climate variability, climate change, and shifting patterns of land use are a human problem, not simply a problem for the natural or the physical world. Therefore, this product will focus on examining the vulnerability of human health and socioeconomic systems to global change. The potential impacts of environmental changes on human systems will be characterized by focusing on three core areas of impact and adaptation: human health, human welfare, and human settlements.

The three topics are fundamentally linked, but are unique dimensions of global change. Human health is one of the most basic and direct measures of human welfare; however, the concept of human welfare encompasses a much broader array of economic and quality of life impacts. Further, the impact of global change on human health and welfare will depend greatly on changing settlement patterns in the United States over the coming decades. Therefore, the product will cover the distinct scientific research in each area and illustrate the connections between them.

1.1.1. Effects of Global Change on Human Health

Health effects associated with global change are wide-ranging and occur via pathways of varying directness, scale, and complexity. Timely knowledge of human health impacts may support our public health infrastructure in devising and implementing strategies to prevent, compensate, or respond to these effects. Over the past decade, several research and agenda-setting efforts have called for continued and expanded research and development of methods in this area. These potential effects have been described in recent assessments from the Intergovernmental Panel on Climate Change Third Assessment Report (IPCC, 2001), World Health Organization reports (WHO, 2003), a report from the National Research Council (NRC, 2001), and the U.S. National Assessment (EHP, 2001; NAST, 2000). Given the complex interactions among physical, biological, and human systems, this research requires well-integrated interdisciplinary approaches that span the breadth from fundamental research to applications.

The most comprehensive assessment to date of the potential impacts of climate variability and change on human health in the United States was published in 2000 as part of the First National Assessment of the Potential Impacts of Climate Variability and Change undertaken by the U.S. Global Change Research Program. This Health Sector Assessment (HSA)

examined potential impacts and identified research and data gaps to be addressed in future research. Its results appeared in a special issue of *Environmental Health Perspectives* (May 2001). HSA focused on four questions:

1) What is the current status and what are the current stresses on the Nation's health?
2) How might climate variability and change exacerbate or ameliorate current or potential future public health stressors?
3) What is the country's capacity to adapt to climate variability and change?
4) What essential knowledge gaps must be filled to fully understand the potential human health impacts of climate variability and change in the United States?

Each question was evaluated for five categories of health stressors: extreme heat and cold, extreme weather events (e.g., storms and floods), air pollution health effects, water- and food-borne diseases, and vector- and rodent-borne diseases. HSA assessed the cumulative impact of likely future changes in exposure (i.e., regions and associated populations that are affected), sensitivity (how those affected respond), and adaptation (structural and behavioral responses in response to or anticipation of changes).

The Health Sector Assessment conclusions follow:

- Populations in northeastern and midwestern U.S. cities are likely to experience the greatest number of illnesses and deaths in response to changes in summer temperatures (McGeehin and Mirabelli, 2001).
- The health impacts of extreme weather events hinge on the vulnerabilities and recovery capabilities of the natural environment and the local population (Greenough *et al*., 2001).
- If the climate becomes warmer and more variable, air quality is likely to be affected. However, the specific types of changes … are a matter of speculation (Bernard *et al*., 2001).
- Federal and State laws and regulatory programs protect much of the U.S. population from water-borne disease; however, if climate variability increases, current and future deficiencies in areas such as watershed protection, infrastructure, and storm drainage systems will probably increase the risk of contamination events (Rose *et al*., 2001).
- It is unlikely that vector- and rodent-borne diseases will cause major epidemics in the United States if the public health infrastructure is maintained and improved (Gubler *et al*., 2001).
- Multiple levels of uncertainty preclude any definitive statement on the direction of potential future change for each of the health outcomes assessed (Patz *et al*., 2000).

Finally, HSA found that much of the U.S. population is protected against adverse health outcomes associated with weather and/or climate by existing public health and medical care systems, although certain demographic and geographic populations are at increased risk.

Section 1 of SAP 4.6 will expand the focus on impacts of global change on human health to include an examination of the adaptive strategies that have been or are expected to be developed by the public health community in response to the challenges and opportunities posed by climate variability and change.

1.1.2. Effects of Global Change on Human Welfare

Section 2 of the report will focus on the relationship between global change and human welfare. Previous assessments have identified potential impacts across a range of sensitive natural systems that affect quality of life (NAST, 2001). For example, global change is expected to impact the hydrologic cycle, sea level, regional climates, and unique habitat, which in turn have implications for water quality, coastal property, air quality, and endangered species. However, while many changes have clearly negative impacts, some are more benign or even positive. Human welfare is a fundamental way to conceptualize the net impact of such changes.

Human welfare is also defined by distinct categories that will help organize the assessment. For example, previous Environmental Protection Agency (EPA) guidance on preparing economic analyses provides a classification

scheme for ecological benefits that distinguishes between direct and indirect effects. In turn, direct effects reflected in markets are distinguished from non-market effects (USEPA, 2000). These three categories—market, non-market, and indirect—can also be used as a framework to examine the state of research on global change and human welfare.

Some core aspects of quality of life are expressed directly in markets through income, consumption, personal wealth, and corporate profits—therefore, easier to measure. Some of these direct market-based impacts will likely be addressed in other synthesis and assessment products. The focus on human welfare in SAP 4.6 is on non-market effects. Although some of these aspects of human welfare are difficult to measure and value (Mendelsohn *et al*., 1999; EPA, 1995), others can be measured in economic terms. For example, a wide range of climate-sensitive natural amenities directly impact quality of life. These amenities have an economic value reflected in property values and the allocation of people's limited leisure time. Both represent revealed consumer preferences that have been widely measured using well-developed methods such as hedonic price models and travel cost estimation (EPA, 2000). This section of the report will examine the literature and research gaps in this area as they relate to global change's impact on natural amenities not directly traded in markets, but whose value can be quantified.

On the other hand, many core values central to quality of life are more difficult to quantify in monetary terms, but have been empirically examined and measured by researchers. For example, rather than simply measure "loss of life" in monetary terms, researchers have developed concepts such as quality adjusted life years. Other concepts such as equity reflect core quality of life values that are applied to the community rather than to the individual level. This product will examine the relevant research addressing these more difficult to quantify aspects of human welfare that are tied to climate-sensitive amenities. This will have important linkages to the human settlements section that follows, since many of these difficult to quantify aspects of human welfare are tied to communities, neighborhoods, and social networks.

1.1.3. Effects of Global Change on Human Settlements

Scaling up from individuals, human "systems" may be characterized in a variety of ways. In this third section of the report, we will focus on human settlements. The IPCC Third Assessment Report (IPCC, 2001) concludes that settlements are among the human systems that are the most sensitive to climate variability and change. For example, projected changes in climate extremes could have devastating consequences for human settlements that are vulnerable to droughts and wildfires, floods and storm surge, heat waves, avalanches, land slides, and windstorms. While specific changes in these extreme conditions as a result of climate change cannot yet be predicted with great certainty, climate change is expected to increase the frequency and severity of some if not all of these types of events in different regions.

The emphasis here on human settlements will be distinct from the emphasis, in the previous sections, on the health and welfare of the inhabitants of these settlements. Aggregating populations in specific types of communities in specific regions introduces new vulnerabilities and resiliencies in the face of global change. The focus of this section will be on the interaction between the characteristics of these settlements and the various climate and environmental stressors. For example, many of our most valuable landscapes for development are also our most vulnerable. Similarly, the most inherently vulnerable individuals in our society are also often bound the most tightly to place, limiting their adaptive capacity even further.

A particular focus will be on urban and highly developed population centers in the United States. This focus is consistent with the recommendation from the First National Assessment on priorities for future assessments (NAST, 2001). Simply because of their high density, urban areas multiply human risk, and this is compounded by relatively high proportions of the very old, the very young, and the poor. In addition, because of the scale of built environments, transportation networks, and energy and resource demands,

urban areas can exacerbate their own vulnerability to externally imposed environmental change; one example is the potential for increased heat-related morbidity and mortality as a function of both a warmer climate and a more intense urban heat island effect. The Metro East Coast Assessment (one of the First National Assessment's regional assessments; Rosenzweig *et al*., 2001)—with its focus on densely settled areas along the northeast coast of the United States—found a broad range of vulnerabilities to projected climate change impacts, including more severe storm surges, beach erosion, and flooding risk to low-level transportation infrastructure; stressed water resource management systems and sewer and drinking water infrastructure; increased risk of heat-related illness; increased energy demands to cope with warming; and increased potential for sudden extreme events requiring large-scale and well-organized emergency management preparations and responses.

The importance of urban centers and their near surroundings is only expected to grow over time, as they are the locus for much of the new development and population growth in the United States. Furthermore, a disproportionate share of this urban growth is expected to concentrate population in areas like the Inter-Mountain West or the Gulf Coast, which are inherently more vulnerable to environmental change. Such trends have the potential to, over time, be maladaptive. The idea that human settlements are likely to be among the sectors that could be "... most easily adapted to climate change, given appropriate planning and foresight and appropriate technical, institutional and political capacity" (IPCC, 2001) may become less and less valid.

In this context, the major focus of this portion of the report will be on high-density (and/or rapidly growing) settlements and the potential for changes over time in their place-based (e.g., climatic regime, elevation, proximity to coasts and rivers, etc.) and/or form-based (e.g., sprawling, compact, etc.) vulnerability to climate-related effects such as heat waves, drought and water supply limitations, wild fire, extreme precipitation, tornadoes, mudslides, wind and storm surge damage, flooding, and other stressors.

1.2. Questions to be Addressed

1.2.1. Questions regarding Human Health Impacts

SAP 4.6 will provide a timely update to the 2000 Health Sector Assessment (Patz *et al*., 2001) while exploring new ground through analyses of the prevention, control, and treatment strategies that may be applied to the potential health impacts of climate change. Lessons learned from domestic and, to a lesser degree, international studies will be incorporated. Where applicable, transboundary issues (e.g., climate impacts on the introduction and spread of infectious disease within the United States from outside sources) will be addressed.

The human health impacts section will be organized in two parts and will incorporate questions derived from those that appear in Chapter 9 of the CCSP Research Strategy. The key focus for SAP 4.6 is summarized in the following question:

> *What are the potential human health effects of global environmental change, and what climate, socioeconomic, and environmental information is needed to assess the cumulative risk to health in the United States from these effects and to inform adaptations in the provision of public health and health care interventions?*

Human Health Part 1: Impacts. The first part focuses on an assessment of the potential impacts in the United States of global environmental change (especially climate variability and change) on four health endpoints: water-borne illnesses, vector- and rodent-borne illnesses, human morbidity and mortality associated with changes in air quality (incorporating results from recent and ongoing assessments of the impacts of climate change on air quality), and human morbidity and mortality associated with extreme weather and temperature extremes. For each of the four health endpoints, the assessment will address, but not be limited to, the following topics:

- What are the potential impacts of global changes, especially changes in climate variability and change, in the United States?

- Where possible, assess the potential indirect effects, such as impacts on quality of life or on economic outcomes.
- What research or data gaps exist, that if bridged, would allow significant advances in the assessment of impacts of global change on human health?

Human Health Part 2: Adaptation. The second part of the human health section of the report will focus on adaptation to the potential impacts of environmental change on human health in the United States. The topics that will be considered may include, but not be limited to, the following:

- Assess adaptation efforts (including prevention, response, or treatment strategies) either presently underway or considered for responding to the human health impacts of climate variability and change in the United States.
- What scientific information do public health decisionmakers require to develop effective adaptation responses in the United States?
- What are the best methods for developing and evaluating tools and information products designed to enhance public health adaptations and support effective decisionmaking?
- How can the capacity of public health and societal infrastructure in the United States be improved to prevent, detect, and effectively respond to health impacts associated with environmental change?
- What research or data gaps exist, that if bridged, would allow significant advances in the evaluation of adaptation of strategies for protecting human health in response to the challenges and opportunities posed by global change?

1.2.2. Questions regarding Human Welfare Impacts

The human welfare section of the report will focus on impacts related to changes in climate and land use. The core questions will also be based on issues highlighted in Chapter 9 of the CCSP Research Strategy. The key question regarding Human Welfare Impacts is framed in Question 9.2 of the CCSP Research Strategy, as follows:

What are the current and potential future impacts of global environmental variability and change on human welfare, what factors influence the capacity of human societies to respond to change, and how can resilience be increased and vulnerability reduced?

Human Welfare Part 1: Impacts. This section will explore research on the human welfare impacts of global change with the following questions as a starting point:

- How might the combined effect of climate change, climate variability, and evolving patterns of land use alter key aspects of Americans' quality of life? Specifically, the section will examine non-market measures of human welfare associated with the following issues:
  - Health-related quality of life
  - Recreational opportunities and the experience of recreational resources affected by changing and variable climate conditions (e.g., skiing in areas where climate change reduces annual snowfall or recreational fishing in water bodies whose temperature has been affected)
  - Changes in aesthetic and recreational experience related to impacted species and altered habitats
  - Aesthetic experience of cities, infrastructure, and ecosystems that are subject to increased extreme weather events (i.e., the impact of these aesthetic changes on property values and employment growth, and, in turn, changes in public sector revenues tied to these socioeconomic trends)
  - Aesthetic and property value impacts related to changes in air quality (i.e., recreational enjoyment and or changes in property value associated with air quality degradation)
  - Aesthetic and property value impacts related to changes in water quality (i.e., recreational desirability)
  - Aesthetic quality and ability to preserve unique human settlements and vulnerable ecosystems in the face of extreme weather events and an altered landscape.

Recent and ongoing assessments of the potential impacts of climate change on air quality and on human health, water quality, and ecosystems will quantify

effects and allow for the valuation of various measures of human welfare.
- How might the distribution of the types of human welfare impacts described above vary across socioeconomic groups (e.g., age, income, race)? In particular, are some groups more vulnerable to the impacts of global change?
- How may methods be refined to more comprehensively assess the non-market human welfare impacts related to the broad range of potential global environmental changes?
- What are the important research gaps that, if addressed, would allow for better characterization of the human welfare impacts of global change?

Human Welfare Part 2: Adaptation. The second part of the section will focus on adaptation to these potential human welfare impacts. This section will address, but not be limited to, the following topics:
- What adaptation efforts (including prevention and response strategies) are presently underway or under consideration that respond to the human welfare impacts of climate change, climate variability, and evolving patterns of land use in the United States?
- Do these adaptation efforts adequately serve the unique needs of socioeconomic groups that might be more vulnerable to the effects of environmental change (e.g., seniors, low-income households)?
- What scientific information do decisionmakers require to develop effective adaptation responses? In particular, what strategies or policies minimize quality of life impacts related to global change and attempt, where possible, to improve human welfare in the face of such forces?
- What are the best methods for developing and evaluating decision-support tools or information products designed to enhance human welfare adaptations and support effective decisionmaking?
- How can the capacity of public and community infrastructure be improved to prevent, detect, and effectively respond to impacts associated with environmental change?
- What important research gaps exist in this field that, if addressed, would allow for better understanding of adaptation of human welfare to the impacts of climate change, climate variability, and evolving patterns of land use?

1.2.3. Questions regarding Human Settlements Impacts

The third section of the report will focus on the impacts on human settlements of climate variability and change and land-use change. The Human Settlements Impacts section will incorporate questions derived from those appearing in Chapter 9 of the CCSP Research Strategy.

Human Settlements Part 1: Impacts. This section will address, but not be limited to, the following questions on the impacts of climate variability and change and land-use change on human settlements:
- What are the current and potential future impacts of climate variability and change on human settlements in the U.S., in particular urban population centers and highly developed areas? What transboundary impacts (e.g., the potential immigration of large populations from areas hard hit by extreme events or by other climate-related issues) are anticipated in the United States?
- How do the distribution of the types of human health and welfare impacts vary across distinct community types (e.g., central city, suburban, exurban neighborhoods; coastal vs. inland cities; small, medium, and large metropolitan regions)? Are some places more vulnerable to the impacts of global change?
- How might potential future changes in the patterns of development and consumption alter the characteristics of U.S. settlements?
  - Physiographic (e.g., coastal, mountain, arid region, floodplain, etc.)
  - Physical (e.g., size, urban heat island, impermeable surface, green space, etc.)
  - Socioeconomic characteristics (e.g., water and energy demand, travel behavior, industrial activity, etc.)

  How may these changes influence the capacity of human settlements to respond to global change?

- How might the combination of these changing settlement patterns with climate variability and change affect resource management (e.g., water, fish, agriculture, forestry, and natural reserves), coastal zone management, and the effectiveness of public environmental and infrastructure programs in the United States?
- How might the combination of these changing settlement patterns with climate variability and change alter the distribution of human health and welfare impacts across socioeconomic groups? Will some groups become more vulnerable to global change due to changes in mobility, access to health care, and access to emergency services?
- What are the important research gaps that, if addressed, would allow for better characterization of the impacts of climate variability and change on human settlements in the United States?

Human Settlements Part 2: Adaptation. The second part of the human settlements section will focus on adaptation to the potential impacts of environmental change on human settlements in the United States. The following questions, and others identified by the authors, will be addressed:

- What are the adaptation efforts (including prevention and response strategies) either presently underway or being considered for responding to the impacts of climate variability and change on U.S. settlements?
- To what extent do these strategies address social justice issues associated with the unique needs of different socioeconomic groups?
- What scientific information do decisionmakers require to develop effective adaptation responses?
- What are the best methods for developing and evaluating tools and information products designed to enhance human settlement adaptations and support effective decisionmaking?
- How can the capacity of societal infrastructure be improved to increase resilience and reduce vulnerability of human settlements to global change?
- What are the important research gaps that, if addressed, would allow for better understanding of effective adaptation to climate variability and change in evolving human settlements in the United States?

1.3. Audience and Intended Use

SAP 4.6 is designed to serve decisionmakers interested in using science to inform adaptations to the impacts of climate variability and change and land-use change in the utilization and distribution of public health resources and health care services, in the understanding and advancing of human welfare, and in the planning and management of human settlements in the United States. The goal is to provide factual information on the impacts of environmental change on human health, human welfare, and human settlements to public health authorities and other public planning and resource management entities to allow for well-coordinated responses to the impacts of global change. The report will be useful for shaping the future development and evaluation of decision-support activities, particularly with regard to improving the interactions between the scientific research community and the public planning and resource management communities.

2. Contact Information and Role of Lead Agency

EPA is the lead agency for this synthesis and assessment product, with Department of Energy (DOE), National Aeronautics and Space Administration (NASA), National Oceanic and Atmospheric Administration (NOAA), and National Institutes of Health (NIH) as the contributing agencies. Because EPA is the lead agency, the product will be subject to EPA guidelines for implementing the Information Quality Act and for meeting the requirements of the Federal Advisory Committee Act (FACA). EPA is responsible for coordinating the acquisition of the authors' time and travel as needed, except for authors that are employed by Federal agencies. Contact information for responsible individuals at lead and contributing agencies follows.

CCSP Agency	Agency Leads
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3. Authors

EPA is responsible for compiling and synthesizing the contributions from the authors listed in this prospectus to produce the final SAP 4.6 deliverable. The final report will undergo a FACA committee review as well as all other reviews called for in the U.S. Climate Change Science Program guidelines.

The lead and supporting agencies have prepared a list of nominees for Lead Authors, based on interest in this product and a record of accomplishments in the relevant fields of expertise. Biographical information for the Lead Author nominees is included in Appendix A.

3.1. Lead Authors, Contributing Authors, and Required Expertise

The writing team will include three Lead Authors. These authors will each be responsible for one section of the overall report. In addition, the three Lead Authors will nominate Contributors to help in the preparation of the three report sections. These Contributing Authors may also be nominated by the public (see Section 3.3).

Collectively, the Lead Authors and the Contributing Authors will be responsible for preparing the initial draft of the three sections of the report, including the text and any analysis required to synthesize the underlying studies on which the product is based. The authors will rely on the existing peer-reviewed literature as the basis for their report. The Lead Authors will decide how best to organize their respective teams, including division of responsibility and time requirements among the Contributing and Lead Authors. In addition, the Lead and Contributing Authors will be responsible for responding to comments from public and scientific reviews. All authors should be accomplished writers and have technical backgrounds in at least one field relevant to the implications of climate variability and change and land-use change on human health, human welfare, and human settlements in the United States.

Overall project guidance, preparation of the Executive Summary, and the lead for responding to reviewer comments on the document as a whole will be the responsibility of the Convening Lead Author for the project—Dr. Janet Gamble, from the Environmental Protection Agency. As the Convening Lead Author, she will be responsible for compiling and synthesizing the contributions from the Lead Authors. This includes providing guidance for the entire project, assembling the final report (including harmonizing all of the written contributions and editing the document for consistency and clarity), preparing the Preface and Executive Summary, and responding to reviewer comments on the document for each round of reviews. During the review phase, the EPA Convening Lead Author will work with the Lead and Contributing Authors to develop responses to comments from the public and from scientific reviews, and will formally document all responses.

3.2. FACA Review Committee and Required Expertise

As lead agency, EPA will convene a FACA committee composed of approximately 10 independent expert reviewers. This committee will function under the requirements of the Federal Advisory Committee Act. The FACA Review Committee's deliberations related to substantive matters will take place in a public forum. Meetings of the FACA Review Committee (including conference calls and face-to-face meetings) will be announced in the Federal Register

Notice no less than 15 days in advance of the meeting. The FACA Review Committee will represent the interests of the scientific community, both in terms of reviewing the substance provided by the product and the quality of the writing. They will provide an independent scientific review, in the form of a written review document (including individual panel member comments as well as summary comments), to ensure that SAP 4.6 accurately represents the state of the science and conveys the interests of public health and resource management communities addressing the impacts of climate change and land-use change on human health, non-market measures of human welfare, and human settlements.

Each member of the FACA Review Committee should be an agreed-upon expert in at least one of the topics included in this product. In selecting FACA members, EPA will consider candidates with expertise in human health, public health, environmental economics, social sciences, urban planning, environmental engineering, ecological systems, geography, and political science. To ensure independence and avoid conflicts of interest, reviewers will not be employees or recent contractors or grantees of the lead agency. In addition, no member of the FACA Review Committee will participate in any way on this product's writing team.

3.3. Author Nominees

The following three Lead Authors have been nominated by the sponsoring agencies to participate in the overall coordination of SAP 4.6 (see Appendix A for brief biographical sketches):

Human Health:	Dr. Kristie L. Ebi
Human Welfare:	Dr. Frances Sussman
Human Settlements:	Dr. Thomas J. Wilbanks

Please contact Janet L. Gamble, Ph.D., at the U.S. Environmental Protection Agency, 1200 Pennsylvania Ave., NW, Mail Code 8601 N, Washington, DC 20460, 202-564-3387 (gamble.janet@epa.gov) to nominate Contributing Authors on or before July 10, 2006. Nominations should include a current CV and a list of publications. The Lead Authors will organize the input of the Contributing Authors, with each having specific assignments based on scientific expertise.

4. Stakeholder Interactions

Numerous entities—including Federal, State, and local governments and agencies, and non-governmental organizations—are engaged in securing human health and welfare and protecting human settlements. Consultation with these decisionmakers will be embedded in the writing process, as Contributing Authors make appropriate contacts with stakeholders during the preparation of the synthesis and assessment product. The writing team will develop, in consultation with the agency sponsors, specific processes for engaging stakeholders in the project.

5. Drafting Process

A comprehensive literature review will be conducted to provide background material and to help guide development of the report. EPA's Convening Lead Author, together with the Lead Authors for the three sections of the report, will review the assembled bibliographic materials. The Lead Authors will then develop a framework for each of the chapters that addresses the questions enumerated in this prospectus.

The Lead Authors and the Contributing Authors will confer through e-mail exchanges and teleconferences to prepare a detailed outline. All Lead Authors will be involved in preparation of an introductory section to describe the topic, the audience, and the intended uses of the product. The process for preparation of this report will be consistent with the guidelines for preparing CCSP synthesis and assessment products. The materials referenced in this report will be derived exclusively from the existing peer-reviewed scientific literature.

6. Review

There will be a number of opportunities for both expert peer review and public comment. The time table for these reviews appears in Section 8 of this prospectus. SAP 4.6 will be reviewed according to the process outlined in the *Guidelines for Producing CCSP Synthesis and Assessment Products*: (1) a first draft, upon clearance by the CCSP, will be released for public comment and will undergo an expert, scientific review by an independent FACA review panel convened by EPA; (2) a second draft, incorporating the comments received from the FACA review panel and those from the public, will be made available on the CCSP web site along with a document describing the disposition of reviewer comments; (3) this second draft will undergo a second FACA peer review; (4) a third draft will be prepared, in response to the comments received from the second FACA peer review, along with a document describing the disposition of comments, and will undergo final review and approval through the CCSP and the National Science and Technology Council. This will constitute the final report.

The expert peer review process will engage the independent scientific reviewers convened as a FACA committee by EPA. The public is invited to nominate independent scientific reviewers to the FACA review committee. Nominations should be e-mailed to Janet L. Gamble, Ph.D., (gamble.janet@epa.gov) by July 10, 2006. Nominations should include CVs and publications lists. The expert peer review process will involve one or more face-to-face meetings of the FACA Review Committee in compliance with the Federal Advisory Committee Act and with the requirements for peer review from the Office of Management and Budget Final Information Quality Bulletin for Peer Review ("OMB Peer Review Bulletin") issued December 16, 2004. Each expert FACA committee member will review the document as a whole. The FACA Review Committee will submit a written report of their findings to the Convening Lead Author.

The major objectives of the FACA Review Committee are to provide advice and recommendations on (1) the scope of the report, (2) the methods used to synthesize the results and conclusions, (3) the veracity of the literature cited, and (4) determination of whether the report's conclusions are supported by the literature. Specific and detailed review charges will be developed and provided to the FACA Review Committee to guide the process.

When the first draft report is released to the FACA Review Committee, the report will also be released for public comment for at least 45 days. Notice of the public comment period will be disseminated on the CCSP web site, in the Federal Register, and through other publications, web sites, and other means as appropriate to encourage wide public participation in the review. Following the public and first FACA review, EPA, and the Lead and Contributing Authors, will revise the first draft by incorporating comments and suggestions from the reviewers, as deemed appropriate. EPA and the Lead and Contributing Authors will prepare a document detailing the disposition of all comments. A second draft along with a document detailing the disposition of all comments will be submitted to the FACA Review Committee for a second evaluation.

Next, EPA and the Lead and Contributing Authors will prepare a third draft, taking into consideration the FACA Review Committee's comments on the second draft. EPA and the Lead and Contributing Authors will prepare a document detailing the disposition of all comments from the second FACA review. Once revisions are complete, EPA will determine if the product has been prepared in accordance with the Information Quality Act (including ensuring objectivity, utility, and integrity as defined in 67 FR 8452), and will submit SAP 4.6 to the CCSP Interagency Committee for approval. If the CCSP Interagency Committee determines that further reviews are necessary, their comments will be sent to EPA for consideration and resolution by the lead and sponsoring agencies in conjunction with the Lead and Contributing Authors.

If the CCSP Interagency Committee review determines that no further revisions are needed and that the product has been prepared in conformance with the *Guidelines for Producing CCSP Synthesis and Assessment Products* (see

<http://www.climatescience.gov/library/sap/sap-guidelines.htm>) it will be submitted to the National Science and Technology Council for clearance. Clearance will require the concurrence of all members of the Committee on Environment and Natural Resources. Comments generated during the National Science and Technology Council review will be addressed by the CCSP Interagency Committee in consultation with the lead and sponsoring agencies and the Lead and Contributing Authors.

7. Communications

The lead agency will produce and release the completed product using the standard format for all CCSP synthesis and assessment products. The final product and the comments received during the expert review and the public comment period will be posted on the CCSP web site. Once the document has been cleared by the National Science and Technology Council process, the product will be prepared for both web and hardcopy dissemination. Final report production and layout will be managed by professional technical editors and writers. The number of hardcopies and the distribution process will be determined as part of the development of the product.

A communications plan for review and distribution of the product will be developed by the lead and contributing agencies along with the Lead Authors. One mechanism for alerting the public health community to the assessment process and findings would be to request a special session at the American Public Health Association's annual meeting in November 2006. At that time, APHA members could be informed about the project and invited to participate in the public comment period in Spring 2007.

In addition, journal editors will be contacted by the lead and contributing agencies and by the Lead Authors to determine whether interest can be generated for publishing the entire SAP 4.6 in a scientific journal (as was done for the Health Sector Assessment in *Environmental Health Perspectives* in 2001).

8. Proposed Timeline

The SAP 4.6 Working Committee expects completion of the product by December 2007. The completion date will depend upon the various review processes. Specific tasks and expected completion dates follow.

2006

June	Prospectus posted on CCSP web site for public comment (30 days)
July	Final prospectus posted on the CCSP web site
Aug	Author teams begin preparation of draft report

2007

Jan	EPA completes first draft report, submits to FACA Review Committee, and releases for public comment (45-day review period)
Apr	FACA Review Committee meets to consider first draft
Aug	EPA completes response to review panel and to public comments and prepares second draft; draft submitted to FACA Review Committee and made publically available along with the documentation of the disposition of comments
Oct	FACA Review Committee meets to consider second draft
Dec	EPA completes response to FACA Review Committee and prepares third (final) draft to submit to CCSP and the National Science and Technology Council

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Appendix A. Biographical Information for Lead Authors

Human Health Lead Author

Dr. Kristie L. Ebi is a Senior Managing Scientist in Exponent's Health Sciences practice and is based in Alexandria, VA. Dr. Ebi is an epidemiologist who has worked in the field of global climate change for eight years. Her research focuses on potential impacts of climate variability and change, including impacts associated with extreme events, thermal stress, food-borne diseases, and vector-borne diseases, and on the design of adaptation response options to reduce current and projected future negative impacts. Before joining Exponent, she conducted research while at the Electric Power Research Institute and the WHO European Centre for Environment and Health in Rome, Italy. She is chief editor of the upcoming book "Integration of Public Health with Adaptation to Climate Change: Lessons Learned and New Directions." She is a Lead Author for the Human Health chapter of the Intergovernmental Panel on Climate Change Fourth Assessment Report. She was a Convening Lead Author on the WHO publication: Methods of Assessing Human Health Vulnerability and Public Health Adaptation to Climate Change, and she has been Lead Author in the Millennium Ecosystem Assessment and the U.S. National Assessment of the Potential Consequences of Climate Variability and Change. Dr. Ebi has more than 25 years of multidisciplinary experience in environmental issues, and has more than 50 publications. Dr. Ebi's scientific training includes a M.S. in toxicology and a Ph.D. and MPH in epidemiology, and two years of postgraduate research in epidemiology at the London School of Hygiene and Tropical Medicine.

Human Welfare Lead Author

Dr. Frances Sussman is an independent consultant experienced in a range of analytical and policy topics related to the environment and economics. For the past 13 years she has worked almost exclusively on international and domestic climate change issues, including impacts and adaptation, emissions trading, emissions inventory uncertainty, international policy options, and forestry. Within the context of climate change, she has completed several projects related to valuation. For the US Environmental Protection Agency (USEPA), she prepared a paper summarizing and evaluating the arguments made by ecologists and economists for and against current ecosystem valuation techniques and methods used by economists in benefit-cost analyses. She also prepared a brief, unifying framework for understanding market and non-market valuation categories in the context of the national climate impacts assessment, and the economic (and non-economic) values placed on natural and human resources potentially affected by climate change. More generally, she has co-authored a number of articles on the economic analysis of environmental issues, including valuation of life and discounting, which have appeared in peer-reviewed journals. Over the years, she has assisted in defining the analytical frameworks for several assessments of the potential benefits of proposed environmental regulation (primarily toxic substances and pesticides), and supervised supporting, targeted literature reviews on market and non-market values of both ecosystems (specifically birds and waterfowl) and human mortality and morbidity. Dr. Sussman is also experienced in synthesizing and presenting research and papers conducted by multiple authors. Her work in this arena includes assisting USEPA in preparing early versions of the national climate impacts assessment, an effort that required combining and unifying papers from diverse disciplines. She also was the primary author of a synthesis report for EPA entitled "Climate Change Mitigation Strategies in the US Forestry and Agriculture Sectors." More recently, she was lead author on a report for

USEPA synthesizing, summarizing, and analyzing three place-based assessments currently being funded by USEPA. Prior to consulting independently in 2000, she was a Project Manager at ICF Consulting for 9 years. Her additional experience includes employment at the Congressional Budget Office, the U.S. Environmental Protection Agency, and the Bureau of Economic Analysis at the Department of Commerce. She received a Ph.D. in Economics from the University of Maryland in 1986.

Human Settlements Lead Author

Dr. Thomas J. Wilbanks is a Corporate Research Fellow at the Oak Ridge National Laboratory and leads the Laboratory's Global Change and Developing Country Programs. Dr. Wilbanks is a past President of the Association of American Geographers (AAG), one of only two non-academics to serve as the president in its more than 100 years, and has been awarded a number of honors in that field. He conducts research and publishes extensively on such issues as sustainable development, energy and environmental policy, responses to global climate change, and the role of geographical scale in all of these regards (i.e., global to local scales and how scale differences and interactions matter). Dr. Wilbanks played roles in the Global Change and Local Areas project of the Association of American Geographers (1995-2000); the first U.S. National Assessment of Possible Consequences of Climate Variability and Change (1997-2000); the Intergovernmental Panel on Climate Change (IPCC) Working Group II (Impacts, Adaptation, and Vulnerability) Third Assessment Report; and aspects of the UNEP et al. Millennium Ecosystem Assessment related to issues of geographic scale and regional and local assessments. More recently, he is serving as Coordinating Lead Author for the IPCC's Fourth Assessment Report, Working Group II, Chapter 7: Industry, Settlement, and Society. He is a member of the Board on Earth Sciences and Resources of the U.S. National Research Council (NRC) and Chair of NRC's Committee on Human Dimensions of Global Change. He is also a member of the Scientific Steering Group for the U.S. Carbon Cycle Research Program, a member of the Panel on Earth Science Applications and Societal Needs of the NRC "decadal study" of Earth Science and Applications from Space: A Community Assessment and Strategy for the Future, a member of a current NRC panel on public participation in environmental assessment and decision-making, and a member of the Steering Group for an NAS/NRC Urban Sustainability Project being initiated in 2005.