

**DOT Center for Climate Change and Environmental Forecasting****Product 4.7: Impacts of Climate Variability and Change on  
Transportation Systems and Infrastructure – Gulf Coast Study**

<b>CCSP Goal 4:</b>	Understand the sensitivity and adaptability of different natural and managed ecosystems and human systems to climate and related global changes
<b>CCSP S/A Product 4.7:</b>	Within the transportation sector, a summary of climate variability and change sensitivities, potential impacts, potential responses, and decision tools
<b>Initial Research:</b>	Impacts of Climate Variability and Change on Transportation Systems and Infrastructure: Gulf Coast Study
<b>Sponsoring Agency:</b>	U.S. Department of Transportation
<b>Supporting Federal Partners:</b>	U.S. Geological Survey

**1. Overview: Description of Topic, Audience,  
Intended Use, and Questions to be Addressed*****1.1. Background***

Through consultation with transportation professionals, researchers, and partners, the U.S. Department of Transportation (DOT) has identified a need within the transportation community for improved information about climate variability and change when making transportation decisions. A sound transportation system is vital to the nation's social and economic future. Investments in transportation are substantial, and result in infrastructure that lasts for decades. Transportation plans and designs should therefore be carefully considered and well informed by a range of factors, including consideration of climate variability and change. Climate also affects the safety, operations, and maintenance of transportation infrastructure and systems. This research will investigate the potential impacts of climate variability and change on transportation infrastructure and its operation, and provide guidance as to how transportation planners and decision makers may incorporate this information into transportation planning decisions to ensure a reliable and robust future transportation network.

While this research focuses on the implications for transportation systems and infrastructure of climate variability and change, the Department is also conducting research to better understand the contributions of transportation emissions of greenhouse gases (GHGs) to the process of global change, identify transportation strategies and technologies to increase energy efficiency and reduce GHG emissions from transportation sources, and develop and improve analytic tools for use by transportation researchers and decision makers.

In October 2002 the U.S. DOT Center for Climate Change and Environmental Forecasting (the Center), with the support of the U.S. Environmental Protection Agency (EPA), Department of Energy (DOE), and the U.S. Global Change Research Program (USGCRP) / Climate Change Science Program (CCSP), sponsored an interdisciplinary workshop to define research priorities

1 regarding the potential impacts of climate variability and change on transportation. Sixty-four  
2 leading experts and decision-makers participated, exploring the key challenges climate  
3 variability and change may pose for transportation in specific regions and for specific  
4 transportation modes, including roadways, transit, rail networks, airports, vessels, pipelines and  
5 marine ports. DOT has posted workshop background papers and a report of the workshop at:  
6 <http://climate.volpe.dot.gov/workshop1002/index.html>. This product will address priority areas  
7 identified at the workshop, including: 1) assessment of potential impacts on critical infrastructure  
8 locations and facilities, 2) development of improved tools for risk assessment and decision-  
9 making, and 3) assessment of response strategies.

10  
11 To select DOT's initial research project, a cross-modal DOT working group solicited and  
12 reviewed a range of project concepts for research that would address the needs identified in the  
13 stakeholder workshop. In developing its recommendation the working group assessed the extent  
14 to which the research would:

- 15
- 16 • Increase the knowledge base regarding the risks and sensitivities of transportation  
17 infrastructure to climate variability and change, the significance of these risks, and the range  
18 of adaptation strategies that may be considered to ensure a robust and reliable transportation  
19 network
- 20 • Provide relevant information and assistance to transportation planners, designers, and  
21 decision makers
- 22 • Build research approaches and tools that would be transferable to other regions or sectoral  
23 analyses
- 24 • Produce near-term, useful results
- 25 • Address multiple aspects of the research themes recommended by the October 2002  
26 workshop
- 27 • Build on existing research activities and available data
- 28 • Strengthen DOT partnerships with other Federal agencies, state and local transportation and  
29 planning organizations, research institutions, and stakeholders.
- 30

31 The Gulf Coast Study was selected by DOT as the first of a series of research activities that the  
32 Center will pursue to address these research priorities. This initial product will focus on the low-  
33 lying Gulf of Mexico coastal zone which has little topographic relief but it is heavily populated.  
34 In addition, the area's transportation modes are both unique and economically significant. For  
35 example, the Ports of New Orleans and Houston are the top two ranking U.S. ports in tonnage.  
36 Roughly two thirds of all U.S. oil imports are transported through this region. Pipelines  
37 traversing the region transport over 90 percent of domestic Outer Continental Shelf oil and gas.  
38 Almost half of the Nation's repetitive flood damage claims are paid to homeowners and  
39 businesses in this region, and the efficacy of evacuation during storms is an important  
40 determinant of the safety and well-being of its population. Given its low elevation, the area is  
41 particularly vulnerable to sea level rise, which is expected to accompany climate variability and  
42 change. The effects of sea level rise may exacerbate the significant changes in land surface  
43 subsidence in the region, which is as high as 1 cm/yr in parts of East Texas and Southeast  
44 Louisiana.

1 The overarching question in this research area is, “How may climate variability or change affect  
2 decisions required to plan, build and manage our transportation network? What tools do  
3 transportation decision makers need to integrate information on climate variability and change  
4 into their investment and management decisions?” These are large questions that will require  
5 substantial research over time. This study may serve as a prototype for analysis in other regions  
6 of the potential risks to transportation from climate variability and change, and the range of  
7 response strategies that may be considered.  
8  
9

## 10 *1.2. Project Description*

11 This study will identify the potential effects of climate variability and change in transportation  
12 infrastructure and systems in the central U.S. Gulf coast. The purpose of this study is to develop  
13 knowledge and tools that will assist transportation decision makers in incorporating climate-  
14 related trend information into transportation system planning, design, engineering, and  
15 operational decisions. Implications for all transportation modes – surface, marine, and aviation –  
16 will be addressed. This project will develop decision-support tools to assist transportation  
17 decision makers in assessing risks and evaluating response strategies. This three phase study  
18 will:  
19

- 20 • Develop knowledge about potential transportation infrastructure sensitivities to climate  
21 changes and variability through an in-depth synthesis and analysis of existing data and  
22 trends;
- 23 • Assess the potential significance of these sensitivities to transportation decision makers in  
24 the central U.S. Gulf Coast region;
- 25 • Identify potential strategies for adaptation that will reduce risks and enhance the  
26 resilience of transportation infrastructure and services;
- 27 • Identify or develop decision support tools or procedures that enable transportation  
28 decision makers to integrate information about climate variability and change into  
29 existing transportation planning and design processes.  
30

31  
32 There are several intended uses for the products of this study. The findings of this study will help  
33 inform local and regional transportation decision makers in the central U.S. Gulf Coast. The  
34 study will also contribute to research methodologies in this new area of investigation that can be  
35 applied to other regions and communities. For example, Phase I will identify priority databases  
36 and methodologies for the integration of data for analysis in a GIS format, develop formats for  
37 mapping products, and develop criteria for assessing and ranking infrastructure sensitivities to  
38 the potential impacts of climate variability and change. Each of these outputs will offer useful  
39 information and example methodologies to research activities in other regions, as well as to  
40 transportation and planning decision-making processes in other areas. This research will also  
41 help scientists and science agencies better understand the transportation sector’s information  
42 needs, leading to improved data and better decision support.  
43  
44  
45

### 1.3. Federal Sponsors

The U.S. Department of Transportation (DOT) and the U.S. Geological Survey (USGS) signed a memorandum of understanding in January 2004 agreeing to cooperate on research that will inform decision makers and the public about the potential effects of climate variability and change on the nation's transportation systems. Pursuant to an interagency research plan agreement developed under this MOU, DOT will be the lead agency on this project, supported by USGS, with other Federal agencies participating as appropriate. Primary research support will be provided by USGS. The USGS has the staff and facilities needed to perform much of the work envisioned by DOT. In addition, the USGS has established partnerships and cooperative agreements with other federal agencies and universities in the Gulf Coast region that enable the completion of this study in close coordination with DOT.

## 2. Contact Information for Responsible Individuals at the Lead and Supporting Agencies

### Department of Transportation (Lead Agency)

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Environmental Forecasting  
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### U.S. Geological Survey (Supporting Agency)

Virginia Burkett  
National Wetlands Research Center  
U. S. Geological Survey  
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337-266-8500

## 3. Lead Authors

This study will require an interdisciplinary approach that integrates natural science disciplines with expertise in risk assessment, transportation and planning. DOT and USGS will develop a research team that provides the necessary expertise in multiple fields, based on each agency's mission and core capabilities. USGS will coordinate the provision of scientific research support, coordinating expertise in climate change science and impacts assessment; meteorology; hydrology; risk analysis; and economics. DOT will provide expertise in transportation planning, engineering, design and operation through a Transportation Analysis Team. As part of this team, DOT's Bureau of Transportation Statistics (BTS) will support geospatial and other data collection and analysis related to transportation.

Authors of the research project reports will be USGS scientists, DOT researchers, and cooperating researchers with demonstrated expertise in the technical areas listed above. A prospective list of lead authors has been identified by DOT and USGS. Biographical information for principal researchers and authors is included in Appendix A.

Virginia Burkett, Ph.D. USGS (Coordinating Author)  
Leticia Alston, Ph.D., Texas A&M  
Thomas Doyle, Ph.D., USGS

1 Kay Drucker, DOT Bureau of Transportation Statistics  
2 Ronald Hagelman, Ph.D., University of New Orleans  
3 Steve Hartley, M.S., USGS  
4 Eric Lindquist, Ph.D., Texas A&M  
5 Joanne R. Potter, DOT (consultant); (Coordinating Author)  
6 Michael J. Savonis, DOT Federal Highway Administration  
7 Matthew Sheppard, DOT Bureau of Transportation Statistics  
8 Arnie Vedlitz, Ph.D., Texas A&M  
9

10 Additional lead authors, and contributing authors, can be nominated to the lead agency contact,  
11 Mr. Michael Savonis, at any time prior to initiation of the research project (i.e., until the final  
12 prospectus is approved by the CCSP Principals and is published on the CCSP website). The lead  
13 agency will select authors (lead and contributing authors) from the pool of those nominated at  
14 that time.

#### 15 16 17 **4. Stakeholder Interactions**

##### 18 19 **4.1. Stakeholder Participation**

20  
21 As discussed above, the focus of this research project grew out of stakeholder input obtained  
22 through an interdisciplinary workshop held in October 2002 by the DOT Center, with the support  
23 of the EPA, DOE, and USGCRP / CCSP. Participants provided input on research priorities  
24 regarding the potential impacts of climate variability and change on transportation. The  
25 workshop background papers and a report of the workshop are available at:  
26 <http://climate.volpe.dot.gov/workshop1002/index.html>.

27  
28 The study requires an interdisciplinary approach drawing on the participation of a range of local  
29 and regional decision makers and stakeholders from transportation and environmental agencies,  
30 regional planning offices, industry, and other key participants. Consultation with local and  
31 regional decision makers and stakeholders will be embedded in the research process, and will be  
32 initiated by the research team in the first stages of the project and maintained as an ongoing  
33 project component. Contacts with local and regional decision makers and stakeholders will be  
34 primarily one-on-one meetings for data collection and to obtain insights relevant to the project.  
35 The research team will develop, in consultation with the sponsoring agencies, the specific  
36 processes used to collect project input and information from stakeholders.

37  
38 Individuals or organizations interesting in providing input should contact Dr. Virginia Burkett at  
39 the email address provided above.

##### 40 41 42 **4.2. Expert Panel**

43  
44 To help ensure a high quality research initiative, USGS and DOT will identify individuals to  
45 provide technical advice to the project through an Expert Panel. Members of the Expert Panel  
46 will have expertise in local and regional decision making processes and tools; transportation

1 planning, engineering, and operations; and scientific expertise in modeling, geospatial data and  
2 analysis, climate change science, meteorology, and hydrology. The Expert Panel will fill four  
3 roles in this study:

- 4
- 5 • Provide perspectives on the implementation and refinement of the study approach
- 6 • Provide expert guidance on transportation-sector information needs and potential climate  
7 change impacts
- 8 • Review the synthesis of climatic data, status and trends analyses, and scientific literature  
9 relevant to the project
- 10 • Review and comment on data products and draft reports.

11  
12 Members of the Expert Panel will be regularly engaged throughout the research project to  
13 provide appropriate guidance and input according to their areas of expertise. The Panel will  
14 receive regular updates on the status of the research, and will be consulted to review data  
15 products and draft reports for each Task prior to proceeding to subsequent Tasks. A password-  
16 protected website will be established to facilitate participation by Panel members in review of  
17 draft materials. It is expected that most communications with the panel will take place through  
18 email correspondence and teleconference. The panel will meet in person at least twice during the  
19 research process. The meetings will take place within the study region.

20  
21 The Expert Panel will be selected jointly by DOT and USGS during the first task of Phase I based  
22 on recommendations from lead authors, CCSP member agencies, and state/local stakeholders.

23  
24 Recommendations of individuals to serve on the Expert Panel should be submitted to Dr. Virginia  
25 Burkett at the email address provided above.

## 26 27 28 **5. Drafting: Process and Materials to be Used**

29  
30 This research will be conducted as a multi-year phased project with three phases, with products  
31 generated by phase, as illustrated in Figure 1. In Phase I, the research team will 1) compile data  
32 in geospatial format that is needed to assess the vulnerability of the transportation sector in the  
33 Gulf region; and 2) develop and demonstrate an approach for conducting an integrated  
34 assessment of transportation risks for a geographic region. This approach will then be refined  
35 and applied to selected locations during Phase II.

36  
37 A detailed scope for Phase I will be defined in the interagency research plan agreement. The  
38 research objectives and approach for Phases II and III will be developed in detail based on the  
39 findings and recommendations of Phase I. An Expert Panel comprised of local and regional  
40 decision makers and stakeholders will provide input to the final scoping of each Phase.

41  
42 The following provides an overview of the objectives and anticipated products for Phase I. The  
43 anticipated objectives and products for Phases II and III are then summarized.

## 5.1. Phase I – Synthesis of Existing Data and Information and Preliminary Vulnerability Assessment

Research conducted in Phase I will provide an integrated geospatial overview of climate and weather trends and projections in the central U.S. Gulf Coast region with other relevant environmental, economic, and demographic data; and an overview assessment of relative risks and vulnerability to transportation infrastructure and facilities in the region based on these data. An important component of Phase I is the compilation of data such as shoreline erosion, land use change, and land surface elevation trends which stem from processes that are independent of climate but significantly influence the impacts of sea level rise and climatic variability on transportation in low-lying coastal areas. These factors can lead to unique vulnerabilities when combined with increased sea level or precipitation, but they are poorly understood in terms of their cumulative impacts on transportation infrastructure. This is the first study to attempt to integrate the suite of climate and non-climate variables into knowledge and decision-support tools to support transportation decision-makers. These geospatial products and public domain data will be made available to regional and local transportation planners and decision makers in state and regional agencies for their use.

The research team will develop and demonstrate an approach for conducting an integrated assessment of transportation risks. Based on the overview assessment, a limited number of sub-locations will be selected for in-depth analysis in Phase II using this approach.

### 5.1.1. Phase I Tasks

Phase I will be conducted through the following five Tasks.

- *Task 1: Define Regional Boundaries and Organize Expert Panel*

In consultation with the sponsoring agencies, the research team will provide a map and brief descriptive report of the proposed study area and its boundaries, and establish and convene an Expert Panel. The Expert Panel will review the research plan and assist the research team in further refining the study approach.

- *Task 2: Collect, Synthesize, and Integrate Geospatial Information and Baseline Data for the Region*

The research team will collect and synthesize data summarizing trends and projected changes in key climate, weather, demographic, economic, and geophysical variables in the Gulf Coast region, drawing on historic data, simulation models, and published literature. To the extent sufficient data is available, projections will be presented for timeframes to 2030 and 2050, with projections to 2100 for selected variables. Data will include:

- Trends, projections, and alternative methodologies (e.g. analogues from the past or other locations) related to climate, sea level, erosion, subsidence and other factors that influence Gulf Coast transportation
- Critical infrastructure locations, including highways, railroads, terminals, marine ports, pipelines, airports, and intermodal facilities
- Relevant economic data
- Relevant social, political, and demographic data

- 1 - Geospatial trends from data collected by the National Geodetic Survey's National Spatial
- 2 Reference System
- 3 - Tide and stream gauge data from NOAA's National Water Level Observation Network
- 4 and the USGS surface water observation network

5  
6 Detailed information on scope and criteria for data will be developed in the interagency  
7 research plan agreement. The research plan will also address how any potential data gaps will  
8 be dealt with, including consideration of the use of earlier time frames, use of proxy data, and  
9 use of expert judgment to supplement missing data. The research team will present summary  
10 trends of data using maps, graphs, and tables as appropriate. The research team will provide a  
11 consolidated report accompanied by associated geospatial products.

- 13 • *Task 3: Characterize Range of Vulnerabilities Within Study Region and Define Pilot*
- 14 *Location for Task 4*

15 Based on an analysis of data and projections identified in Task 2 and other relevant factors,  
16 the research team will recommend one potential research site for the Phase I preliminary  
17 vulnerability assessment. This recommendation will be derived from three sub-tasks:

- 18 - Consideration of the impact of projected changes in climate and weather on
- 19 transportation infrastructure
- 20 - Assessment of the vulnerability of Gulf transportation infrastructure as a product of
- 21 additional stressors, such as subsidence, and of socio-demographic factors, such as
- 22 population concentrations and presence of critical infrastructure
- 23 - Assessment of indicators of the feasibility of further study.

24  
25 The research team will characterize potential impacts and develop a region-wide description  
26 of how climate variability and change may affect transportation infrastructure, including  
27 maintenance, design, operations, and planning implications.

28  
29 The research team will narrow the focus of the study on potential climate variability and  
30 change impacts to a subset of specific locations along the Galveston Bay to Mobile Bay  
31 corridor that exhibit particular transportation infrastructure vulnerability. This will be  
32 accomplished by assessing the layered GIS information on physical and social vulnerability.  
33 It is estimated that three locations of a regional (metropolitan planning organization) or  
34 county level within the study area will be selected in which the age, condition, and location  
35 of transportation infrastructure make them particularly vulnerable to physical/structural  
36 damage from climate variability and change factors such as sea level rise, storm surge,  
37 precipitation changes and temperature changes. In consultation with the Expert Panel, one  
38 location of a regional (metropolitan planning organization) or county level within the study  
39 area will then be selected. Key factors for the determination of this location may include:

- 40 • Areas currently under environmental stress (from processes such as erosion, and
- 41 subsidence)
- 42 • Topographical characteristics that create potential areas of vulnerability to climate
- 43 change, such as elevation and presence of water features.
- 44 • Presence of key infrastructure defined in terms of economic importance, carrying
- 45 capacity
- 46 • Presence of multiple transportation modes in single locations.



1  
2 Based on an analysis of these factors and consultation with the Expert Panel, the team will  
3 recommend an individual study site for Task 4.

4  
5 • *Task 4: Preliminary Risk and Vulnerability Assessment*

6 The objective of Task 4 is to integrate information from Tasks 2 and 3 and to apply these  
7 variables in a conceptual framework at the specific location identified at the end of Task 3.  
8 The research team will conceptualize and critically examine a risk and vulnerability  
9 assessment matrix that integrates information from Tasks 2 and 3. The matrix will be  
10 examined by the DOT transportation analysis team, the Expert Panel and by a sample of local  
11 decision-maker stakeholders. This preliminary model will then be applied to selected location  
12 for testing and refinement.

13  
14 The research team will provide a report summarizing the preliminary assessment of risks,  
15 vulnerabilities, and recovery potential for the study location, and propose a conceptual model  
16 for a risk-vulnerability–recovery decision matrix and summary of results from an external  
17 assessment of the matrix.

18  
19 The resulting risk and assessment tool will be further developed in Phase II. The product of  
20 Phase I will be a conceptual model; further refinement to operationalize this framework and  
21 assign meaningful values will occur in Phase II.

22  
23 • *Task 5: Final Report and Recommendation of Specific Areas for Phase II Analysis*

24 In Task 5, the research team will recommend locations for further study in Phase II, based on  
25 criteria developed in consultation with the Expert Panel and the project sponsors. A final  
26 overview assessment report of Phase I will be produced.

27  
28  
29 *5.1.2. Phase I Products*

30  
31 The expected products of Phase I research will be a consolidated report accompanied by  
32 geospatial products, including:

- 33  
34 • A compilation and synthesis of existing weather and climate trends and model  
35 projections; economic, social, and demographic data; and locations of key infrastructure  
36 and facilities. This information will be presented through geospatial mapping products.  
37 • An assessment of regional and local trends in sea level, subsidence, erosion, streamflow,  
38 temperature, and other related factors that influence the vulnerability of existing  
39 transportation infrastructure.  
40 • A ranking of infrastructure sensitivities to potential impacts of various climate variability  
41 or change factors in the central U.S. Gulf Coast, relative to their significance to  
42 transportation.  
43 • A conceptual framework for risk and vulnerability assessment, piloted at one study  
44 location.  
45 • Recommendation of specific locations for in-depth analysis in Phase II, focusing on the  
46 impacts of selected climate variability and change factors.

## 5.2. Phase II

The objective of research in Phase II is to conduct an in-depth assessment of impacts and risks to selected areas and facilities (as identified in Phase I) and to contribute to the development of risk assessment tools and techniques that can be used by transportation decision makers to analyze the vulnerability of other areas.

The expected products of Phase II research are:

- An in-depth assessment and report of selected high priority impacts on specific areas, facilities, or corridors.
- Building on the conceptual framework developed in Phase I, a risk assessment template for use by transportation decision makers to identify and assess potential vulnerabilities
- A report on the integration of climate data into existing transportation decision making processes.

Phase II will be scoped in detail based on the results of Phase I, and additional products may be identified at that time to support this objective.

## 5.3. Phase III

The objectives of Phase III are to identify the range of potential adaptation strategies available to federal, regional, and local transportation managers to respond to the risks identified in Phases I and II; to identify the potential strengths and weaknesses of these responses; and to develop an assessment tool that may assist transportation managers in selecting adaptation strategies appropriate to their agency, community, or facility, and to the identified sensitivity to climate change.

The expected products of Phase III research are:

- A compilation and description of potential adaptation strategies for use by transportation managers
- An assessment tool or tools for use by transportation managers in evaluating adaptation strategies
- Recommendations for further research.

Phase III will be scoped in detail based on the results of Phases I and II, and additional products may be identified at that time to support this objective.

#### 5.4. *Proposed Approach for Evaluation and Communication of Uncertainty and Confidence Levels, where Applicable*

Any assessment of potential climate change impacts must consider both the variability and change in climate and the vulnerability of the elements affected. Rather than relying on a single model for the climate components of this assessment, a range of plausible climatic and environmental futures will be determined based upon three principal considerations: historic trends; consensus in the published literature regarding the trajectory of sea-level change, regional climatic trends, and extreme events; and areas of agreement in output among various climate models. Where and when appropriate during the research project, confidence levels will be discussed based on observational evidence, models, and widely-accepted theory, following guidance published by Working Group 1 of the Intergovernmental Panel on Climate Change (IPCC 2001). Broadly framing the assessment approach using IPCC guidance is consistent with the DOT Center Strategic Plan for 2001-2005 (DOT 2000). The interpretation of climate model output, status and trends analyses, and scientific literature will involve some degree of expert judgment and evaluation. In some cases alternative methodologies (e.g. analogues from the past or at other locations) may be applied to validate both the scenarios and the assessment of potential impacts. These types of data and information products will be reviewed by technically qualified individuals on the Expert Panel to ensure that they are valid, complete, unbiased, objective, and relevant.

### 6. Review

The academic process of peer review is founded on the structured, collegial evaluation by peers who are qualified to render judgment on the material to be reviewed. Peer reviews for the products of this study will range from internal peer review by DOT and USGS staff who were not involved in the development of the study products to formal, independent, external peer review. All reviews will be conducted at a level commensurate with the importance of the interpretive products produced by the study team. Review of draft products by the Expert Panel will occur at a date to be agreed upon with the panel membership. The study team will address all comments from the expert panel and the external peer reviews in a formal fashion, documenting each comment and each response.

For products requiring external review, the sponsoring agencies will develop a pool of technical reviewers to review the draft product. The review will be equivalent to a journal peer review with each reviewer preparing an independent review. Independent reviewers will include both scientific and technical experts, and non-scientist decision makers, to assess the clarity of the draft product.

All selected authors and reviewers will be provided with the information quality guidelines issued by the Department of Commerce and NOAA (which also incorporate compliance with the overall Office of Management and Budget (OMB) guidelines: *OMB Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies*).

1 Final research products and reports will be submitted for the CCSP review process, including  
2 participation as appropriate by partner agencies and Interagency Working Groups and posting for  
3 public comment.

4  
5 Reviewers will be selected by the sponsoring agencies in consultation with the research team and  
6 the CCSP Agency Principal Representatives. Recommendations for individuals to serve as  
7 reviewers should be submitted to Dr. Virginia Burkett, at the email address provided above.

8  
9 The dates of expert peer review and public comment period will be determined by the sponsoring  
10 agencies, and posted on the CCSP website no less than 30 days in advance of the review.

## 11 12 13 **7. Related Activities**

14  
15 This project is not related to other national or international assessment processes, and project  
16 products are not committed for any other purpose. Coordination with other research activities of  
17 CCSP Agencies will occur through regular reports to the CCSP Agency Principal  
18 Representatives by the sponsoring agencies.

## 19 20 21 **8. Communications**

22  
23 Through out the research process, ongoing dialogue with local and regional decision-makers,  
24 technical resources, and transportation practitioners will be facilitated through the meetings of  
25 the Expert Panel and one-on-one interviews with stakeholders, and workshops.

26  
27 At each Phase, opportunities for broad distribution of all research information and products will  
28 be pursued. These will include use of video conferencing; participation by individual members of  
29 the research team in professional conferences, panels, and workshops; and the submission of  
30 articles to relevant scientific and professional journals.

31  
32 A final conference of regional stakeholders will be held to review the final draft report of Phase  
33 III.

34  
35 All research products and reports from this project will be identified as CCSP-sponsored  
36 products, published in a consistent format as part of the family of CCSP-sponsored products, and  
37 will be consistent with DOC/NOAA information quality guidelines. DOT and USGS, working  
38 with the CCSP Office and its communication subgroup, will develop a communications and  
39 dissemination plan to ensure broad availability to the scientific community and the public  
40 (excluding classified data or proprietary information). This dissemination plan will include use  
41 of the CCSP website, announcements of the availability of project reports and products, and  
42 direct distribution as recommended by CCSP.

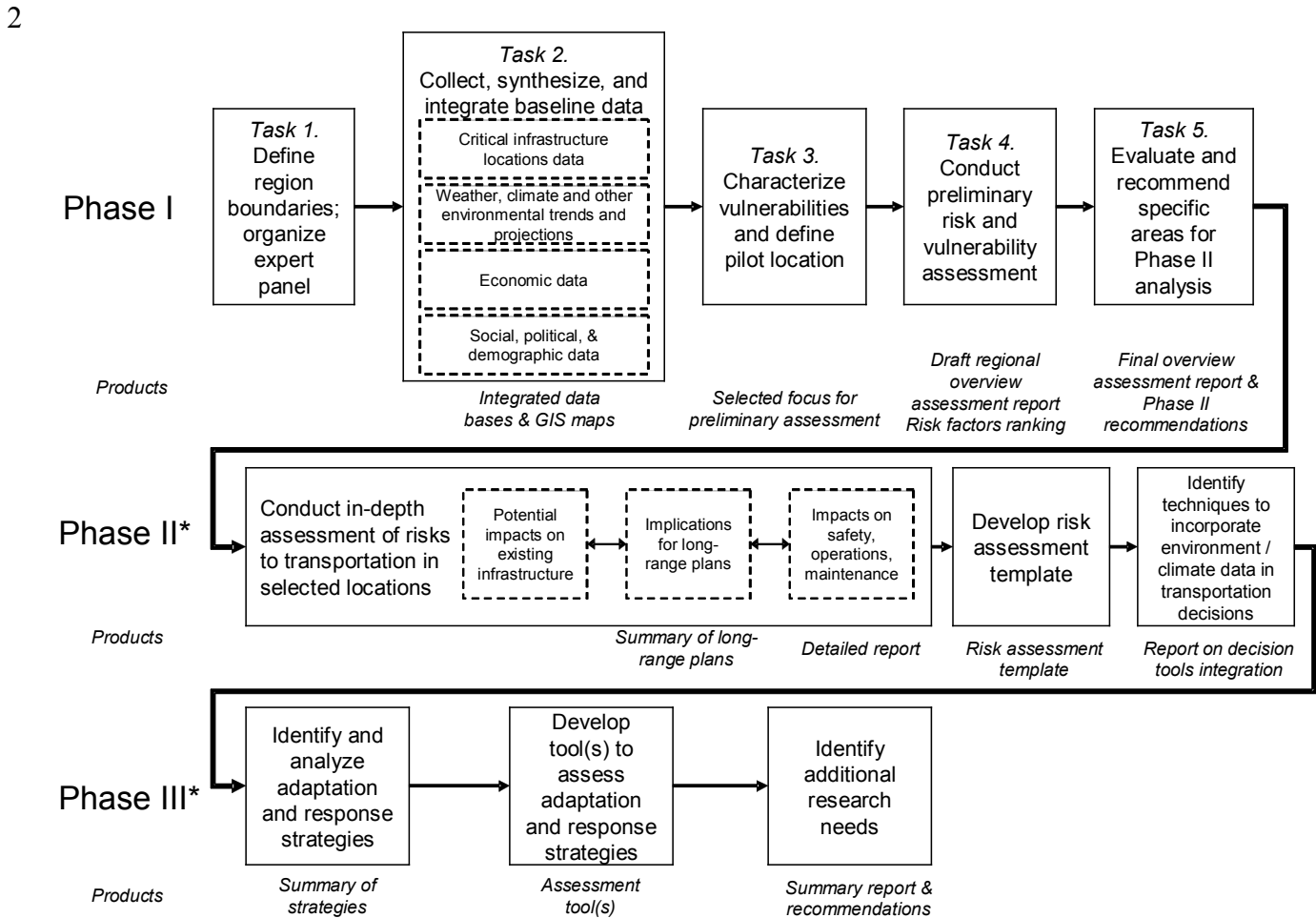
43  
44 All products of this research initiative (excluding classified data or proprietary information) will  
45 be made available to the transportation and research communities and the general public through

1 posting on the DOT Center for Climate Change website and through publication and distribution  
2 of relevant reports.  
3  
4

### 5 **9. Proposed Timeline**

6  
7 Completion of Phase I research is estimated to be completed within 18 months from approval of  
8 the Interagency Agreement between DOT and the Survey and initiation of research. A draft  
9 report will be submitted to CCSP for review. The schedule for production and distribution of the  
10 final report will be contingent on the review process. Although Phase II and III timelines will  
11 ultimately depend on the results from Phase I, DOT anticipates a research period of 18 months  
12 for each phase.  
13  
14

1 **Figure 1. Gulf Coast Study Design**



\*Study design of Phases II and III will be refined based on findings of Phase I.

**Appendix A: Lead Authors – Brief Biographical Information****Leticia T. Alston, Ph.D.**

Dr. Alston is the Associate Director of the Institute for Science, Technology and Public Policy (ISTPP) in the George Bush School of Government and Public Service and an adjunct associate professor in the Department of Sociology at Texas A&M University. She is currently Co-Principal Investigator on two major grants focusing on the utilization and understanding of climate variability/climate change science and the use of scientific information by intergovernmental decision makers and the general public on the Gulf Coast. This research is supported by the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Environmental Protection Agency (USEPA). Her research interests include environmental and natural resource policy, health and health policy, and the public understanding of science. She is familiar with decision-making and stakeholder processes both in theory and in application. Her recent research experience includes development and implementation of both large public surveys and individual in-depth interview guides. These instruments have been developed for both environmental (e.g. watershed and air quality) and technically focused (e.g. biotechnology and infrastructure) projects. (Ph.D., Sociology, University of Texas, 1972; M.S., Sociology, University of Texas, 1965; B.A., Social Psychology, Florida State University, 1962).

**Virginia R. Burkett, Ph.D.**

Dr. Burkett is chief of the Forest Ecology Branch at the National Wetlands Research Center of the U.S. Geological Survey, U.S. Department of Interior, where she has worked since 1990. She also serves as an Associate Regional Chief Biologist for the USGS Central Region. Her expertise includes coastal wetland ecology, wetland forest ecology and restoration, coastal management, and wildlife and fisheries management. Dr. Burkett has served as Director of the Louisiana Coastal Zone Management Program, Deputy Director and Director of the Louisiana Department of Wildlife and Fisheries, and Assistant Director of the Louisiana Geological Survey. She has published extensively on the topics of global change and low-lying coastal zones. Nominated by the U.S. government, she was a Lead Author on the United Nation's IPCC Third Assessment Report (2001) of global climate change and its impacts on coastal and marine ecosystems and she was recently appointed as a lead author of the IPCC's Fourth Assessment report that will be published in 2007. During 2002-2004 she served as a member of the National Research Council's Panel on River Basin and Coastal Systems Planning. Burkett received a B.S. in zoology and an M.S. in botany from Northwestern State University of Louisiana; her doctoral work in forestry was completed at Stephen F. Austin State University in 1996.

**Thomas W. Doyle, Ph.D.**

Dr. Doyle is a systems ecologist in the Forest Ecology Branch at the National Wetlands Research Center of the U.S. Geological Survey, U.S. Department of Interior, Lafayette, Louisiana, where he has worked since 1989. Dr. Doyle's experience includes over 20+ years of field and modeling studies in temperate and tropical ecosystems of the southeastern United States and Caribbean. His expertise focuses on ecosystem analysis and modeling with a special emphasis on development of forest succession and landscape simulation models and understanding the role of natural and anthropogenic disturbance on forest structure and diversity of coastal ecosystems of the Gulf of Mexico and Caribbean regions. Doyle's field projects and model applications have addressed projected impacts of global climate change, sea-level rise, elevated carbon dioxide,

1 and hurricanes on coastal ecosystems along with specific resource management issues of wetland  
2 restoration, fire, wastewater pollution, and landscape fragmentation. He has published  
3 extensively on the topics of global change and hurricane impacts on a variety of coastal  
4 ecosystems. Doyle was a Lead Author on the Environmental Protection Agency regional  
5 assessment for the Gulf Coast entitled “Preparing for a Changing Climate: Potential  
6 Consequences of Climate Variability and Change – Gulf Coast Region. Doyle received a B.S. in  
7 botany at the University of Louisiana, Monroe, Louisiana in 1976 and an M.S. and Ph.D. in  
8 ecology from the University of Tennessee, Knoxville in 1980 and 1983, respectively.

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10 **Kay Drucker**

11 Ms. Drucker is a transportation specialist at the Bureau of Transportation Statistics (BTS), U.S.  
12 Department of Transportation. Ms. Drucker manages and supports ongoing transportation data,  
13 data harmonization and analysis projects at BTS with a focus on areas of environmental and  
14 international transportation data relevance. Ms. Drucker represents the Bureau as a core staff  
15 member in the U.S. DOT Climate Change and Environmental Forecasting Center. She is  
16 responsible for supporting the Bureau's international outreach and partnership activities,  
17 including the coordination of trilateral transportation data projects with Canada and Mexico  
18 through the North American Transportation Statistics Interchange, which includes the exchange  
19 of environmental data and information. Ms. Drucker received her Master's degree in Technology  
20 and International Public Policy with an emphasis on transportation policy from the University of  
21 Denver (1999) and her undergraduate degree in International Relations with a minor in Tourism  
22 (1992) from the California State University, Chico. She has worked in the transportation data  
23 collection, analysis and dissemination field for the last five years and has managed a range of  
24 projects from transportation survey development to ITS data system analysis to preparing  
25 transportation statistical publications for use by the U.S. Congress.

26  
27 **Ronald R. Hagelman III, PhD**

28 Dr. Hagelman received his BA in History and Geography from the University of Texas at Austin  
29 in 1988. Following the completion of his undergraduate degree, he entered the  
30 reinsurance/insurance marketing industry, where he worked full-time until 1994, and part-time  
31 while in graduate school until 1997. During this period he served as VP of Marketing for two  
32 separate marketing consulting firms and successfully started, ran, and eventually sold his own  
33 marketing consulting agency located in New Braunfels, Texas. In 1994 Ron returned to graduate  
34 school, where he completed his master's in Applied Environmental Geography in 1997 and his  
35 PhD in Environmental Geography in 2001. Both degrees were earned from the Department of  
36 Geography at Texas State University in San Marcos, Texas. Dr. Hagelman's dissertation dealt  
37 with the current and historical impacts of urban flooding and flood management policy in San  
38 Antonio, Texas. His dissertation was awarded the Association of American Geographers Hazards  
39 Specialty Group, Gilbert White Dissertation Award for 2002. Dr. Hagelman has been employed  
40 as an Assistant Professor in the Department of Geography at the University of New Orleans in  
41 New Orleans, Louisiana since August 2001. He currently teaches courses in World Geography,  
42 Environmental Impact Assessment, Hazards and Disasters, Urban Geography, Human  
43 Geographic Field Methods, and Coastal Environments. In addition, Dr. Hagelman has been  
44 involved in numerous research grant projects through the Center for Hazards Assessment and  
45 Risk Technology (CHART) located on the UNO campus. Grantors for these projects include The  
46 Environmental Protection Agency, The US Army Corps of Engineers, the Federal Emergency



1 Management Agency, the Louisiana Department of Natural Resources, and the Natural Hazards  
2 Research and Applications Information Center at the University of Colorado. The above efforts  
3 have, thus far, resulted in publications relating to environmental equity and toxic air releases,  
4 social impacts of coastal environmental restoration, freeze-disaster impacts within the citrus  
5 industry, and temporal change analysis of regional census data.

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7 **Stephen B. Hartley, M.S.**

8 Mr. Hartley is currently employed as a Senior Geographer at the USGS/National Wetlands  
9 Research Center. Mr. Hartley is responsible for the installation, configuration and overall  
10 maintenance of software, hardware and networking for Geographical Information Systems (GIS)  
11 operations. His specific duties include managing and coordinating GIS projects, performing  
12 image analysis, developing prototype GIS products, troubleshooting, quality control, personnel  
13 management and training, and client-interfacing. He provides support for the Coastal Wetlands  
14 Planning, Protection and Restoration Act and several other federal studies. Hartley is a co-  
15 principal investigator, along with Dr. James B. Johnston, for the Louisiana GAP Project. Also,  
16 Mr. Hartley provides training in the usage of several GIS/RS software packages. He is a certified  
17 ESRI ArcView instructor (7 yrs). He received his Master of Science degree in geology in 2000  
18 from the University of Louisiana at Lafayette. Mr. Hartley has published several technical  
19 reports, articles, and map products that illustrate his experience in GIS and remote sensing.

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21 **Eric Lindquist, Ph.D.**

22 Dr. Lindquist is an Associate Research Scientist at Texas A&M University with a joint  
23 appointment with the Institute for Science, Technology and Public Policy (ISTPP) and the Texas  
24 Transportation Institute (TTI). He has been at TTI for ten years and has been jointly involved  
25 with ISTPP for the past three years. His Ph.D. is in political science (Texas A&M University  
26 2002), as is his Master of Urban Planning (1994). Dr. Lindquist's research and educational  
27 background is in transport and environmental policy, political decision and policy processes, and  
28 agenda setting and problem definition of public policy solutions. He has most recently been  
29 actively involved in research on the public understanding of science in regard to global climate  
30 change and the use of scientific information by intergovernmental decision makers and the  
31 general public on the Gulf Coast. He is also currently Co-Principal Investigator on a major grant  
32 for NOAA focusing on the utilization and understanding of climate variability and climate  
33 change science. His transportation research has ranged from such issues as intelligent  
34 transportation systems policy, sustainable transportation, tourism and transportation and  
35 hazardous transport and ITS.

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37 **Joanne R. Potter**

38 Ms. Potter is a Senior Associate of Cambridge Systematics. She holds a Master's Degree in City  
39 Planning from the Massachusetts Institute of Technology (1994) and a Bachelor of Arts from the  
40 University of Massachusetts, Amherst (1976). Since 1998, she has worked with the Federal  
41 Highway Administration's (FHWA) Office of Planning and Environment to plan and implement  
42 innovative programs for FHWA and DOT related to transportation and environmental issues,  
43 often in collaboration with other operating administrations and with federal, state, and local  
44 partners. Working with DOT staff and senior managers, Ms. Potter facilitated the creation and  
45 implementation of the U.S. DOT Center for Climate Change and Environmental Forecasting (the  
46 Center). She coordinated a scenario-based planning process and was primary author of the

1 Center's five-year strategic plan. Ms. Potter provides strategic planning support to the Center's  
2 research on the potential impacts of climate variability and change on transportation, and  
3 coordinated a 2002 interdisciplinary workshop sponsored by DOT and federal partners to  
4 identify research priorities in this area of investigation. She has assisted several other DOT  
5 programs in planning their research agendas, including strategic planning for FHWA's Planning  
6 and Environment Research Program, the initial design of the Surface Transportation-  
7 Environment Cooperative Research Program, and development of a strategic plan for FHWA's  
8 Surface Weather Research Program. She is coauthor of *Transportation in an Age of Climate*  
9 *Change: What Are the Research Priorities?*, TR News 2003, and author of *Workshop Summary*,  
10 in The Potential Impacts of Climate Change on Transportation: Workshop Summary and  
11 Discussion Papers, DOT 2003.

### 12 **Michael J. Savonis**

13 Mr. Savonis has been the Team Leader for Air Quality in the Office of Natural and Human  
14 Environment of the Federal Highway Administration, U.S. Department of Transportation, since  
15 1996. He has twenty years of experience in transportation, with extensive expertise in air quality,  
16 planning, and emerging environmental issues. Mr. Savonis oversees and administers FHWA's  
17 transportation / air quality research program, oversees policy development and implementation  
18 of the Congestion Mitigation and Air Quality Improvement Program, and oversees FHWA's  
19 public education program on air quality strategies. He was instrumental to the creation of the  
20 U.S. DOT Center for Climate Change and Environmental Forecasting and the development of  
21 the Center's Strategic Plan, and leads FHWA's participation in Center activities. He has been a  
22 member of the Air Quality Committee of the Transportation Research Board (TRB) since 1999,  
23 and has been chair of the TRB Subcommittee on Transportation Control Measures since 2000.  
24 He is author or coauthor of several papers and reports on transportation / air quality and related  
25 topics, including: *Transportation in an Age of Climate Change: What Are the Research*  
26 *Priorities?*, TR News, Transportation Research Board, 2003 ; *Toward a Strategic Plan for*  
27 *Transportation Air Quality Research, 2000-2010*, Transportation Research Record, 1738; and  
28 *Clean Air Through Transportation: Challenges in Meeting the National Ambient Air Quality*  
29 *Standards*, report to Congress, 1993. Mr. Savonis holds a Master's Degree in Regional Planning  
30 from Cornell University (1985) and a Bachelor of Science degree in Chemistry from the State  
31 University of New York at Buffalo (1977).

### 32 **Matthew Sheppard**

34 Mr. Sheppard is a transportation geospatial specialist at the Bureau of Transportation Statistics,  
35 U.S. Department of Transportation. He received his B.A. in Anthropology and Latin American  
36 Studies from the University of Texas at Austin in 1997, and his M.A. in Anthropology from  
37 Pennsylvania State University in 1999. He has been with BTS since 2000 applying GIS-based  
38 technology and analytical methods to a variety of transportation studies, focusing on topics such  
39 as public transit, environmental data, and spatial statistical methodology. He contributes to  
40 transportation research projects, such as the Longitudinal Employment Dynamics (LED) project,  
41 examining commuter patterns using data provided by the U.S. Census Bureau. He led a team of  
42 transit professionals to develop data content standards for public transportation geospatial data as  
43 part of the e-Gov Geospatial One-Stop (GOS) effort and continues to be involved in outreach  
44 efforts to harmonize transit data standards and increase participation in the GOS. He also

1 develops and manages geospatial database design and collection projects of interest to  
2 transportation analysts.

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4 **Arnold Vedlitz, Ph.D.**

5 Dr. Vedlitz is holder of the Bob Bullock Chair in Government and Public Policy and Director of  
6 the Institute for Science, Technology and Public Policy (ISTPP) in the George Bush School of  
7 Government and Public Service at Texas A&M University. He is a Professor of Political Science  
8 at Texas A&M University and Professor of Health Policy at the Texas A&M Health Sciences  
9 Center. He is currently Principal Investigator on three major grants focusing on the utilization  
10 and understanding of climate variability/climate change science and the use of scientific  
11 information by intergovernmental decision makers and the general public on the Gulf Coast. This  
12 research is supported by two grants from the National Oceanic and Atmospheric Administration  
13 (NOAA) and one from the U.S. Environmental Protection Agency (USEPA). He is also the co-  
14 editor of a new book forthcoming from MIT Press, author of an important book on public policy  
15 and author of dozens of scholarly articles and book chapters in the field of politics and public  
16 policy. His teaching and research focus on science and technology policy, minority politics,  
17 public policy, inter-group conflict, American political behavior, urban politics, and political  
18 psychology. (Ph.D., Political Science, University of Houston, 1975; M.A., Government,  
19 Louisiana State University, 1970; B.A., Government, Louisiana State University, 1968).

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