



# **Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act:**

## **EPA's Response to Public Comments**

### **Volume 8: Impacts and Risks to Public Health and Welfare: Other Sectors**

# **Impacts and Risks to Public Health and Welfare: Other Sectors**

**U. S. Environmental Protection Agency  
Office of Atmospheric Programs  
Climate Change Division  
Washington, D.C.**

## FOREWORD

This document provides responses to public comments on the U.S. Environmental Protection Agency's (EPA's) Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, published at 74 FR 18886 (April 24, 2009). EPA received comments on these Proposed Findings via mail, e-mail, and facsimile, and at two public hearings held in Arlington, Virginia, and Seattle, Washington, in May 2009. Copies of all comment letters submitted and transcripts of the public hearings are available at the EPA Docket Center Public Reading Room, or electronically through <http://www.regulations.gov> by searching Docket ID *EPA-HQ-OAR-2009-0171*.

This document accompanies the Administrator's final Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act (Findings) and the Technical Support Document (TSD), which contains the underlying science and greenhouse gas emissions data.

EPA prepared this document in multiple volumes, with each volume focusing on a different broad category of comments on the Proposed Findings. This volume of the document provides responses to public comments regarding impacts and risks to public health and welfare in other sectors.

In light of the very large number of comments received and the significant overlap between many comments, this document does not respond to each comment individually. Rather, EPA summarized and provided a single response to each significant argument, assertion, and question contained within the totality of comments. Within each comment summary, EPA provides in parentheses one or more lists of Docket ID numbers for commenters who raised particular issues; however, these lists are not meant to be exhaustive and EPA does not individually identify each and every commenter who made a certain point in all instances, particularly in cases where multiple commenters expressed essentially identical arguments.

Several commenters provided additional scientific literature to support their arguments. EPA's general approach for taking such literature into consideration is described in Volume 1, Section 1.1, of this Response to Comments document. As with the comments, there was overlap in the literature received. EPA identified the relevant literature related to the significant comments, and responded to the significant issues raised in the literature. EPA does not individually identify each and every piece of literature (submitted or incorporated by reference) that made a certain point in all instances.

Throughout this document, we provide a list of references at the end of each volume for additional literature cited by EPA in our responses; however, we do not repeat the full citations of literature cited in the TSD.

EPA's responses to comments are generally provided immediately following each comment summary. In some cases, EPA has discussed responses to specific comments or groups of similar comments in the Findings. In such cases, EPA references the Findings rather than repeating those responses in this document.

Comments were assigned to specific volumes of this Response to Comments document based on an assessment of the principal subject of the comment; however, some comments inevitably overlap multiple subject areas. For this reason, EPA encourages the public to read the other volumes of this document relevant to their interests.

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## Acronyms and Abbreviations

CCSP	U.S. Climate Change Science Program
cm	centimeter
CNA	Center for Naval Analyses
ECWS	East Coast winter storms
EPA	U.S. Environmental Protection Agency
F	degrees Fahrenheit
GHG	greenhouse gases
IPCC	Intergovernmental Panel on Climate Change
mm/yr	millimeters per year
NRC	National Research Council
sq. km	square kilometer
TSD	Technical Support Document
USGCRP	U.S. Global Change Research Program

## **8.0 Impacts and Risks to Public Health and Welfare: Other Sectors**

### **8.1 Energy, Infrastructure, and Settlements**

#### **Comment (8-1):**

Several commenters (3347.1, 3394.1, 3449.1, 3747.1, 7020) state that EPA should include in the Technical Support Document (TSD) an accounting of what the net effect of climate change will be on sectors such as energy consumption, energy production, and transportation. Assertions by the commenters include: that the paragraph in the Proposed Findings on energy, infrastructure, and settlements is “exceptionally vague”; that the TSD statement that “significant uncertainty exists about the potential impacts of climate change on energy production and distribution, in part because the magnitude and timing of climate impacts are uncertain” is insufficient; that the TSD fails to note whether impacts in this section are positive or negative; and that the EPA engages in “speculation” by making a finding of “reasonably anticipated” endangerment while stating that U.S. energy use will be “affected” by climate change and admitting that the net effect on domestic energy consumption is unknown. Overall, the commenters assert that the level of uncertainty that is expressed in the current Energy, Infrastructure, and Settlements section does not justify a finding of “reasonably anticipated” endangerment.

#### **Response (8-1):**

With regard to the comment that the language in the Proposed Findings was vague, we carefully reviewed the relevant section in the Proposal and in the assessment literature. We have revised this section in the Final Findings accordingly; see the Findings, IV.B.2.e, “Energy, Infrastructure and Settlements.”

With regard to net effects, see the Findings, Section IV.B, “The Air Pollution Is Reasonably Anticipated to Endanger Both Public Health and Welfare,” for our response to comments on how the Administrator weighed the scientific evidence underlying her endangerment determination.

Commenters do not explain how our statement regarding uncertainties of the potential impacts of climate change on energy production and distribution is “insufficient.” The referenced statement in the TSD cites CCSP (2007a), and the statement is located on page 48 of that report. CCSP (2007a), as part of the body of peer-reviewed assessment literature summarized in the TSD, expresses the uncertainty associated with projected impacts of climate change and those uncertainties have subsequently been carried over into TSD as well. For example, the TSD cites CCSP (2007a) in stating that “Climate change impacts on U.S. electricity generation at fossil and nuclear power plants are likely to be similar.” In addition, please see Volume 1: General Approach of the Technical Support Document, for EPA’s response to comments on the approach taken in developing the TSD, and the communication of uncertainty as expressed in the underlying scientific literature.

We disagree with the commenters that the TSD should have further characterized in this section whether the impacts were positive or negative. The TSD, including Section 13, reflects the findings of the peer-reviewed assessment literature and reflects, to the extent that this literature does, the “positive” or “negative” nature of an impact. For example, the TSD states that “[w]here extreme weather events become more intense and/or more frequent with climate change, the economic and social costs of these events will increase (high confidence) (Wilbanks et al., 2007).” See the Findings, Section IV.B, “The Air Pollution is Reasonably Anticipated to Endanger Both Public Health and Welfare,” for a discussion of EPA’s approach to positive and negative impacts.

With regard to the comment that a finding of “reasonably anticipated” endangerment is not justified based upon this section, see the Findings, Section IV.B, “The Air Pollution is Reasonably Anticipated to Endanger Both Public Health and Welfare,” for a discussion of the Administrator’s determination.

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**Comment (8-2):**

One commenter (3394.1) states that Section 13 of the TSD on Energy, Infrastructure, and Settlements unjustifiably favors those studies that suggest impacts will be significant over those that predict the opposite, particularly in the area of energy use for heating and cooling. The commenter states that the TSD acknowledges that the net effect on energy consumption is unclear but singles out one “study that predicts a significant increase in electricity demand requiring substantial investment in new generation.” The commenter additionally states that “EPA apparently has not evaluated this study itself and only refers to a CCSP synthesis report that apparently cites it. *Id.* at 106.” Finally, the commenter states that EPA has “deemphasize[d] the greater body of science on this issue.”

**Response (8-2):**

The TSD provides a balanced summary of key synthesis reports. First, we note that the “study” the commenter singles out is CCSP (2007a), which is an assessment report that assesses the literature on *Effects of Climate Change on Energy Production and Use in the United States* and synthesizes the results of multiple studies. The “greater body of science on this issue” is precisely what the CCSP report covers. It states: “The process for producing the report was focused on a survey and assessment of the available literature.” See the Findings, Section III.A., “The Science on Which the Decisions Are Based,” for our response to comments on the use of the assessment literature and our treatment of new and additional scientific literature provided through the public comment process.

In addition, since release of CCSP (2007a), the U.S. Global Change Research Program (USGCRP) has released a new assessment report (Karl et al, 2009), which reinforces the key conclusions of CCSP (2007a). We have revised the TSD to reflect the key conclusion on this issue in Karl et al. (2009): “Warming will be accompanied by decreases in demand for heating energy and increases in demand for cooling energy. The latter will result in significant increases in electricity use and higher peak demand in most regions.” Finally, we note that the commenter did not provide references to any studies that would represent “the greater body of science” on this issue to support the commenter’s assertions. For these reasons, the discussion of this issue in the TSD accurately and clearly reflects the consensus findings represented in the peer-reviewed assessment literature.

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**Comment (8-3):**

Several commenters state that specific aspects of the climate impacts evidence summarized in the TSD with respect to energy, infrastructure, and settlements do not support the Administrator’s endangerment finding.

**Response (8-3):**

The specific issues that underlie these comments are addressed in the responses throughout this volume, and other volumes of the Response to Comments document. With regard to the commenters' conclusion that the current science does not support an endangerment finding with respect to energy, infrastructure, and settlements, we disagree based on the scientific evidence before the Administrator. See the Findings, Section IV.B, “The Air Pollution is Reasonably Anticipated to Endanger Both Public Health and Welfare,” for details on how the Administrator weighed the scientific evidence underlying her endangerment determination in general, and with regard to the energy, infrastructure, and settlements sector in particular.

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**Comment (8-4):**

One commenter (3136.1) states that the TSD devotes significant space to the impacts of climate change on native settlements in Alaska. The commenter states that the native population of Alaska has been dealing with coastal erosion and periods of warming for many thousands of years. The commenter argues that the problems facing these groups are due not to climate change itself but to transitioning from their old nomadic way of life to permanent settlements, which has restricted their ability to respond to variations in the climate.

**Response (8-4):**

Whether or not native Alaskan communities have been experiencing warming or coastal erosion in the past is not dispositive of the question of whether present and projected climate change impacts pose a danger to these settlements. The TSD summarizes the risks to Native Alaskans posed by climate change, including access to food sources and increased risk of flooding and erosion.

With regard to the commenter’s statement that a transition from a nomadic lifestyle is responsible for a restricted ability to respond to variations in climate, we note that climate change impacts are not necessarily dependent on a group being nomadic or living in fixed structures. Additionally, in the context of determining whether greenhouse gases (GHGs) endanger public health and welfare, it is not appropriate for EPA to engage in hypotheticals regarding how if certain cultures or settlements were different today, their circumstances might alter their vulnerability to climate change. Rather, regardless of whether the alleged change to permanent settlements exacerbates the impacts, the evidence of climate impacts to native settlements in Alaska is relevant to determining endangerment.

Finally, see the Finding, Section III.C, “Adaptation and Mitigation,” for our response to comments and approach on the treatment of adaptation and mitigation in the Findings.

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**Comment (8-5):**

One commenter (3136.1) criticizes the TSD for using the word “will” in describing the impacts of extreme events on transportation. The commenter states that the word “may” should be used instead because there is a lack of a signal of increasing extremes related to climate change in the observed record. Several commenters, including 3136.1 and 3596.2, cite Roger Pielke, Jr.’s assessment of the U.S. Climate Change Science Program (CCSP) conclusions on extreme events and climate change—specifically, that there is a lack of evidence of trends toward increasing extreme events in the United States. They present six points that are mentioned:

1. Over the long-term U.S. hurricane landfalls have been declining.
2. Nationwide there have been no long-term increases in drought.
3. Despite increases in some measures of precipitation, there have not been corresponding increases in peak streamflows (high flows above 90<sup>th</sup> percentile).
4. There have been no observed changes in the occurrence of tornadoes or thunderstorms.
5. There have been no long-term increases in strong East Coast winter storms (ECWS), called Nor’easters.
6. There are no long-term trends in either heat waves or cold spells, though there are trends within shorter time periods in the overall record.

One commenter (3596.2) goes on to state that there is no strong support for increased hurricane intensity or frequency in the future. The commenter argues that the lack of correlation between global temperature and U.S. extreme events undermines support for a positive endangerment finding.

**Response (8-5):**

The comment that EPA should have used the word “may” instead of “will” refers to wording in a two-sentence quote taken directly from the summary of a peer-reviewed assessment report produced by the

National Research Council (NRC, 2008). We note that the Intergovernmental Panel on Climate Change (IPCC) and other assessment reports assign probabilities to the projected effects of climate change; these probabilities have been characterized in the Introduction to the TSD. The NRC (2008) report assigned probabilities to projected effects, such as those in the sentence referred to by the commenter. For example, Box S-1 on pages 3 and 4 of NRC (2008) describes the probabilities that the report assigns to those climate change impacts deemed to be of greatest relevance for U.S. transportation. Thus, because the NRC has assigned probabilities and taken these into account when using the word “will” in the sentence in question, and given that our summary in the TSD attributes the statement to the NRC, the language in the TSD is accurate.

For EPA’s response to comments received on the six issues raised by commenters (with the exception of streamflow) regarding the evidence toward increasing extreme events in the United States, see Volume 2 of the Response to Comments document.

For response to comments received on streamflow, future hurricane intensity and frequency, and the correlation between global temperature and U.S. extreme events, see Volume 4 of the Response to Comments document.

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**Comment (8-6):**

One commenter (3283.1) notes that energy efficiency continues to increase without greenhouse gas regulations, through such efforts as ENERGY STAR, renewable energy programs, and tax credits, and that “efficiency gains continue to dominate the energy sector.” The commenter states that “EPA points out that climate change will have a limited impact on heating and cooling demand (+/- 5%). In California, they cite a 20% per capita increase in electricity for cooling under a worst-case scenario of about 10° Fahrenheit (F) heating if there is limited implementation of efficiency measures.” The commenter goes on to note that “Energy Star programs are rapidly causing large efficiency improvements in replacement cooling systems” and that new construction can greatly reduce cooling loads.

**Response (8-6):**

It is not clear how the commenter believes these statements are relevant to the endangerment or cause or contribute findings. To the extent that the commenter is arguing that “efficiency gains” will somehow enable the energy sector to reduce or avoid climate impacts, the commenter does not provide evidence to support the argument. See the Findings, Section III.C, “Adaptation and Mitigation,” for our response to comments on the treatment of adaptation and mitigation in the Findings.

We also note that the TSD does not state that climate change will have a limited impact on heating and cooling demand. Rather, the TSD states that “Generally speaking, the net effects of climate change in the United States on total energy demand are projected to amount to between perhaps a 5% increase and decrease in demand per 1°C in warming in buildings.” Additionally, we have updated the TSD to include the following statement:

Climate warming will be accompanied by decreases in demand for heating energy and increases in demand for cooling energy. The latter will result in significant increases in electricity use and higher peak demand in most regions (Karl et al., 2009).

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**Comment (8-7):**

One commenter (3394.1) criticizes the TSD for engaging in speculation by noting that industries and settlements have become resilient to climate variability but then suggesting that impacts will be greater

than the capacity to adapt. The commenter states that without evidence, this assertion is unwarranted. Additionally, the commenter claims that “[t]his section of the TSD acknowledges that adaptive capacity is a significant factor in determining the severity of impacts to human settlements. *Id.* at 111” and criticizes the TSD for omitting an analysis of adaptation from its assessment.

**Response (8-7):**

After review of the section in question, EPA disagrees with the assertion that we engaged “in speculation” and notes that the commenter did not provide any specific examples, suggested revisions, or new data for our consideration. Also, the commenter mischaracterizes EPA’s statements about adaptive capacity in the TSD. The commenter refers to page 111 for the claim above, and we note that the relevant text on that page of the April 2009 version of the TSD is a quote from an assessment report (IPCC 2007b) that reads as follows:

Poor communities can be especially vulnerable, in particular those concentrated in high-risk areas. They tend to have more limited adaptive capacities, and are more dependent on climate-sensitive resources such as local water and food supplies (high confidence).

This passage clearly states that poor communities can be especially vulnerable to climate change impacts because of more limited adaptive capacities, and clearly does not state or imply—as the commenter asserts—that adaptive capacity is a determining factor in the severity of the climate change impacts themselves. See the Findings, Section III.C, “Adaptation and Mitigation,” for our response to comments on and treatment of adaptation and mitigation in the Findings.

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**Comment (8-8):**

One commenter (3394.1) criticizes the TSD for stating that no single hurricane can be attributed to climate change yet then “engag[ing] in an indirect but speculative attempt to make such an attribution” in stating that the damages from Hurricanes Ivan, Katrina, and Rita are indicators of future climate change impacts.

**Response (8-8):**

EPA is clear in the TSD that no single hurricane can be attributed to climate change, but it does not follow that the impacts associated with a particular past hurricane are not illustrative of the potential damages that could be associated with future hurricanes of similar intensity. The TSD first refers to the scientific literature regarding projections that suggest that extreme weather events are likely to become more intense, and then notes that the impacts of Katrina may be a possible indicator of the kinds of impacts that could occur from more intense extreme weather events. This point is confirmed in CCSP (2007a), which states that “[i]ncreases in storm intensity could threaten further disruptions of the sorts experienced in 2005 with Hurricanes Katrina and Rita.” Thus, EPA approach in the TSD is reasonable.

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**Comment (8-9):**

One commenter (3394.1) argues that the TSD claims incorrectly that land subsidence is a climate change-related occurrence.

**Response (8-9):**

We have reviewed the TSD in light of this comment and have concluded that it neither claims nor gives the impression that land subsidence is a climate change-related occurrence. The comment refers to a quote from NRC (2008): “Climate change will affect transportation primarily through increases in several types of weather and climate extremes, such as very hot days; intense precipitation events; intense hurricanes; drought; and rising sea levels, coupled with storm surges and land subsidence.” We find the existing sentence to be clear: storm surges and land subsidence are factors which can exacerbate the impacts of sea level rise.

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**Comment (8-10):**

One commenter (3561.1) argues that EPA should evaluate the impact of climate change on population migration patterns in the United States.

**Response (8-10):**

In response to this comment, we have added additional information on urban vulnerabilities in Section 13, as well as a discussion of U.S. regional climate impacts in Section 15 of the TSD. We note that the peer-reviewed assessment literature, on which we rely for the TSD, is limited with regard to projections of U.S. population migration impacts, and thus we provide a qualitative, not quantitative, evaluation of this issue.

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**Comment (8-11):**

One commenter (7020) states that the TSD “fails to note a potential beneficial effect, in that a migration toward electricity (in place of primary fuels) will inherently tend to reduce greenhouse gas emissions as an appreciable fraction of electricity in the US that is generated from sources that do not emit greenhouse gases in operation.”

**Response (8-11):**

See the Findings, Section III.C, “Adaptation and Mitigation,” for our response to comments on the treatment of adaptation and mitigation in the Findings. We further note that the commenter’s claim regarding an inherent reduction in greenhouse gas emissions associated with a shift toward electricity generation is by no means assured. Such an outcome would depend on fuel used, as well as the efficiency of the conversion of fuel to energy, in direct use and electric generation.

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**Comment (8-12):**

One commenter (7020) states that Section 13(c), “Infrastructure and Settlements,” overlaps with Section 12(a), “Vulnerable Areas” in the TSD, and that this should be covered in one section for clarity.

**Response (8-12):**

Upon review, we have decided not to integrate these two sections because they address different and important issues. The discussion in the Section 13 on energy, infrastructure, and settlements focuses on the range of potential climate impacts across this sector broadly, while the discussion of vulnerable areas in Section 12 is focused only on sea level rise and coastal areas.

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**Comment (8-13):**

One commenter (7020) states, with regard to buildings, that the majority of the material relates to Russia and applicability to the United States is unclear. Additionally, the commenter states that the impacts to Alaskan buildings are not quantified.

**Response (8-13):**

The discussion of thawing permafrost on Russian buildings is illustrative of the kinds of similar impacts that could manifest in certain regions of the United States as a result of climate change. As noted in Section 13 of the TSD, “The problems now being experienced in Russia may be expected to occur elsewhere in the Arctic if buildings are not designed and maintained to accommodate future warming (ACIA, 2004).” With regard to quantifying the impacts to Alaskan buildings, we have added the following sentence to the TSD: “Overall, the cost of maintaining Alaska’s public infrastructure is projected to increase 10 to 20 percent by 2030 due to warming, costing the state an additional \$4 billion to \$6 billion, with roads and airports accounting for about half of this cost (Karl et al., 2009).” As noted in Karl et al. (2009), private infrastructure impacts in Alaska have not been evaluated. We note that quantification of an impact is not required before the Administrator may consider information in an endangerment analysis. See the Findings, Section IV.B, “The Air Pollution is Reasonably Anticipated to Endanger Both Public Health and Welfare,” for a discussion of how the Administrator approaches the evidence regarding endangerment.

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**Comment (8-14):**

One commenter (7020) criticizes the TSD for failing to quantify the effects on indigenous populations in Alaska. The commenter argues that the TSD would better support an endangerment finding if it included such a quantification.

**Response (8-14):**

Quantitative information about risks to indigenous Alaskan settlements due to climate change is relevant to and provides support for an endangerment analysis, and such information is included in the most recent USGCRP assessment report. Therefore, we have added the following statement to Section 15 of the TSD from Karl et al. (2009): “Over 100 Native Alaskan villages on the coast and in low-lying areas along rivers are at risk of increased flooding and erosion due to warming.” We note that quantification of an impact is not required before the Administrator may consider information in an endangerment analysis. See the Findings, Section IV.B, “The Air Pollution is Reasonably Anticipated to Endanger Both Public Health and Welfare,” for a discussion of how the Administrator approaches the evidence regarding endangerment.

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**Comment (8-15):**

One commenter (3136.1) criticizes the report by the California Energy Commission cited in the TSD that stated that annual electricity demand for air conditioning in the state may increase as much as 20% by 2100. Specifically, the commenter states that three underlying assumptions of the report are that the population will be unchanged in 2100, that energy efficiency measures will not be implemented, and that the “high range temperature scenario” will come to pass. The commenter concludes that these assumptions are unrealistic, thereby rendering the 20% figure meaningless. The commenter also states that this figure must be compared against the figure from a non-climate-change scenario to have any meaning.

**Response (8-15):**

We disagree with the commenter that the conclusion of the California Energy Commission (2006) report with regard to electricity consumption cited in the TSD is “meaningless.” On the contrary, we find that it provides an important quantified example of the potential impacts of climate change on electricity use under a high-temperature-rise scenario. In the TSD, we clearly state the three underlying assumptions that the commenter pointed out. The commenter argues that these assumptions are unrealistic; however, the report’s methodology was judged to be sufficient by the peer-reviewed assessment report CCSP (2007a), which cited the report. Because of this, we conclude that the assumptions are entirely valid for purposes of examining the possible effects of climate change under certain stated conditions. Finally, with regard to the commenter’s criticism that the figure must be compared against a non-climate-change scenario to be meaningful, we note that the estimated increase in annual electricity use figure quoted in the report is relative to the 1961–1990 base period. To give better meaning to the discussion of this report’s findings in the TSD, we have clarified the TSD to note this base period used for comparison.

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**Comment (8-16):**

A commenter (2818) states the importance of infrastructure—including water and sewage treatment plants, roads and transportation systems, hospitals, and disaster response systems—and asserts that there is a strong link between this infrastructure, which is threatened by climate change impacts such as sea level rise and health.

**Response (8-16):**

We agree with the commenter that climate change poses a threat to infrastructure and that if infrastructure were disabled that there could be public health and welfare impacts. The assessment literature finds that there are a number of high-likelihood impacts on infrastructure as summarized in Section 13 of the TSD.

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**Comment (8-17):**

A commenter (3686.1) contends that the TSD fails to mention the severe consequences of increased hurricane intensity on the electricity infrastructure of Louisiana and the Gulf Coast.

**Response (8-17):**

EPA recognizes that hurricane intensity has significant implications for the infrastructure of Louisiana and the Gulf Coast, including electricity infrastructure, and this is mentioned in Section 13 of the TSD. We have also revised the TSD to include new information from Karl et al (2009): “It is not yet possible to project effects of climate change on the grid, because so many of the effects would be more localized than current climate change models can depict; but, weather-related grid disturbances are recognized as a challenge for strategic planning and risk management.”

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**Comment (8-18):**

One commenter (3216.1) notes that communities can be displaced as a result of “increased natural disasters,” and states that “The aftermath of Hurricane Katrina demonstrated that communities affected by a natural disaster can take years to rebuild after their fragile infrastructure is destroyed.”

**Response (8-18):**

We agree with the commenter’s point that natural disasters caused by extreme weather events can have lasting consequences, including displacement of communities. See Volume 4 of the Response to Comments document for our response to comments on projected climate change impacts on extreme weather events.

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## 8.2 National Security

### **Comment (8-19):**

A commenter (3702.1) states that the national security impacts identified in the TSD are too “speculative and attenuated” to be used for an endangerment finding. In particular, the commenter argues that indirect impacts are inadequate to support a finding that climate change endangers U.S. national security since they “involve multiple, complex causal factors involving undefined social, political, and economic events that may or may not occur.”

### **Response (8-19):**

EPA has reviewed Section 16 of the TSD in light of the comments and disagrees that the potential national security impacts of climate change that we identify in the TSD are “speculative and attenuated.” Examination of the literature that EPA cites in the TSD confirms that this discussion is based upon best-available projections of future climate change impacts and expert assessment of the sociopolitical outcomes that could potentially result. In fact, the most recent assessment report of the USGCRP (Karl et al., 2009) provides additional discussion of this issue, and we have revised the TSD to include the following statement in Karl et al. (2009):

In an increasingly interdependent world, U.S. vulnerability to climate change is linked to the fates of other nations. For example, conflicts or mass migrations of people resulting from food scarcity and other resource limits, health impacts, or environmental stresses in other parts of the world could threaten U.S. national security... Meeting the challenge of improving conditions for the world's poor has economic implications for the United States, as does intervention and resolution of intra- and intergroup conflicts. Where climate change exacerbates such challenges, for example by limiting access to scarce resources or increasing incidence of damaging weather events, consequences are likely for the U.S. economy and security.

The position taken in these comments—that the findings of assessments on national security impacts are inadequate because such impacts involve “multiple, complex causal factors” and rely on projections—is neither reasonable nor sound with respect to an assessment of the national security threats associated with climate change or other factors. There are few, if any, issues of this importance that are not affected by “multiple, complex causal factors.” We have determined that the discussion in the TSD clearly acknowledges the issues of concern to the commenters and provides an objective and thorough assessment of current understanding. Additionally, the literature relied upon in the TSD’s discussion of national security impacts has considered the “multiple, complex causal factors” that may be involved in such impacts and has determined that a significant likelihood exists of these impacts occurring. A summary of these determinations is provided in the TSD. See the Findings, Section III.A., “The Science on Which the Decisions Are Based,” for a discussion of our use of assessment literature.

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### **Comment (8-20):**

A commenter (3702.1) criticizes EPA for apparently not consulting directly with any U.S. national security agencies to inform its proposal, as well as for only providing one relevant document from such an agency, the testimony of Dr. Fingar (Fingar, 2008). Similarly, another commenter (3394.1) maintains that EPA’s support for its national security section is “derived from non-scientific sources that are inherently speculative.” A commenter (3394.1) adds to this by calling EPA’s sources for its national security section a “speculative grab bag,” noting that the TSD itself notes that neither the Intergovernmental Panel on Climate Change (IPCC) nor the U.S. Climate Change Science Program (CCSP) has “explicitly addressed

these issues.” One commenter (3372.1) specifically criticizes the Center for Naval Analyses (CNA) Corporation report (CNA 2007), stating that the panel of advisors for the report was given science briefings based upon the IPCC, which the commenter asserts is a “flawed resource” and “vintage science.” The commenter also specifically criticizes two individuals who it states briefed the advisory board on the science: “Anthony Melillo (WRI, Heinz Foundation), co-chair of the discredited 2000 US National Assessment” and James Hansen.

**Response (8-20):**

The sources for the national security section are not “speculative.” The latest U.S. government assessment report, Karl et al. (2009), discusses potential climate change impacts on national security, and we have updated the TSD to summarize the findings of this report. However, because this is an evolving topic area with limited information available in assessment reports, we also supplemented the discussion of national security impacts in the TSD with additional information.

The sources that EPA relied on for characterizing the national security risks of climate change are U.S. government-published or government-funded analyses, as well as a CNA report. We consider these sources legitimate as they typically rely on the assessment literature for their underlying science. With regard to one commenter’s point, EPA did not directly consult with agencies responsible for U.S. national security on their assessment of impacts but rather examined published reports of the U.S. government. Additionally, we note that while the commenters criticized the sources used, they did not provide other literature for our review that discusses the risks to national security from climate change impacts.

The CNA (2007) report, which a commenter specifically criticized, is a widely cited study that was compiled under the direction and review of an advisory board consisting of 11 retired three- and four-star admirals and generals from the U.S. military. The report states that information on the observed effects and projections of climate change impacts was drawn from the IPCC and “peer-reviewed scientific literature, and data, reports, and briefings from various respected sources, including the National Academy of Sciences, the National Oceanic and Atmospheric Administration, the National Aeronautic and Space Administration, and the United Kingdom’s Hadley Centre for Climate Change.” Six individuals of varying backgrounds and expertise are listed in the acknowledgments of the report as having supported the effort and eight other individuals are listed as having briefed the Military Advisory Board. Those individual briefers are: Dr. James Hansen, Dr. Anthony Janetos, Dr. Richard Moss, Mr. Justin Mundy, Maj. Gen. (Ret.) Richard Engel, Mr. Randy Overbey, Mr. Kenneth Colburn, and Dr. Robert Socolow. The combination of these individuals clearly represents a high level of knowledge with regard to the issues being discussed. Specifically, at the time of writing: Dr. James Hansen was the lead climate scientist and director of the NASA Goddard Institute for Space Studies; Dr. Anthony Janetos was the vice president of the H. John Heinz III Center for Science, Economics, and the Environment; Dr. Richard Moss was the senior director for Climate and Energy at the United Nations Foundation; Mr. Justin Mundy was the senior adviser to the Special Representative on Climate Change for the UK Foreign and Commonwealth Office; Maj. Gen. Richard Engel, USAF (Ret.), was the deputy national intelligence officer for science and technology at the National Intelligence Council; Mr. Randy Overbey was the former president of Alcoa Primary Metals Development; Mr. Kenneth Colburn worked for the Center for Climate Strategies; and Dr. Robert Socolow was a professor at Princeton University.

The commenter specifically criticized two of those aforementioned individuals who briefed the report’s advisory board: Dr. Anthony Janetos and Dr. James Hansen. The commenter did not assert that these two had an overwhelming influence upon the CNA (2007) report but rather appears to be attacking the integrity of all of the briefers through questioning these two individuals. Presumably, in the commenter’s first criticism of an individual brifer, the individual in question is Anthony Janetos (commenter referred to an “Anthony Melillo”), and that criticism is based upon two issues: Dr. Janetos having co-chaired the National Assessment Synthesis Team for the U.S. Global Change Research Program report *Climate*

*Change Impacts on the United States*, published in 2000; and that his briefing would have been based upon the same science as in the IPCC reports. EPA notes that the aforementioned USGCRP report has not been discredited and is a part of the body of peer-reviewed assessment literature. The commenter's second criticism of a briefer, Dr. Hansen, appeared to be premised entirely on an issue with the IPCC itself. For response to comments on use of IPCC, CSSP, USGCRP, and NRC reports as the primary scientific basis for the TSD, please see Volume 1 of this Response to Comments document. Overall, we determine that the sources used in this section of the TSD are reliable and the best available for summarizing the potential natural security impacts of climate change.

We have added the following text to the TSD for clarity: "As the discussion on the national security risks of climate change is limited in the assessment literature, this section relies upon the following sources: U.S. government-published or -funded analyses—including the 2009 assessment report *Global Climate Change Impacts in the United States*--and a report by the Center for Naval Analyses (CNA) Corporation. These sources are legitimate as they typically rely on the assessment literature for their underlying science."

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**Comment (8-21):**

Several commenters state that specific aspects of the climate impacts evidence summarized in the TSD with respect to national security do not support the Administrator's endangerment finding.

**Response (8-21):**

The specific issues that underlie these comments are addressed in the responses throughout this volume, and other volumes of the Response to Comments document. With regard to the commenters' conclusion that the current science does not support an endangerment finding with respect to national security, we disagree based on the scientific evidence before the Administrator. See the Findings, Section IV.B, "The Air Pollution is Reasonably Anticipated to Endanger Both Public Health and Welfare," for details on how the Administrator weighed the scientific evidence underlying her endangerment determination in general, and with regard to the national security sector in particular.

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**Comment (8-22):**

One commenter (3702.1) believes that inherent assumptions about human behavior and adaptive capacity are embodied within the projected indirect national security impacts, and this is contradictory to EPA's position not to include consideration of adaptive capacity in the Findings.

**Response (8-22):**

See the Findings, Section III.C, "Adaptation and Mitigation," for our response to comments on the treatment of adaptation and mitigation in the Findings.

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**Comment (8-23):**

A commenter (3702.1) believes that it is "inappropriate for EPA to assume that the U.S. agencies in charge of overseeing national security will fail to fulfill their function or that third parties will act unlawfully—under either domestic, foreign, or international law—in order to justify an endangerment finding."

**Response (8-23):**

We are not assuming that U.S. agencies in charge of overseeing national security will fail to fulfill their function. The TSD summarizes the potential national security impacts of climate change, which in turn

may require action by the U.S. government. It makes no judgment about any specific future action occurring, succeeding, or failing. With respect to the commenter's second point, EPA is not assuming specific unlawful actions will occur. We are summarizing findings of reports prepared by experts regarding the implications of climate change on our national security and broadly discussing how climate change may contribute to, for example, political instability. Nowhere in this discussion does EPA make any assumptions of specific unlawful actions. We also note that EPA is not alone in recognizing the importance of the issue. As noted in the TSD, the U.S. Congress and the Department of Defense recognize and have taken action to assess the implications of climate change on national security.

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**Comment (8-24):**

A commenter (3702.1) states that if potential national security impacts are used to justify an endangerment finding, then additional national security impacts must be considered, including the secondary impacts of mitigation measures and policies. The commenter quotes the testimony of Dr. Fingar (Fingar, 2008) in stating that GHG reduction policies “may affect U.S. national security interest even more than the physical impacts of climate change itself.” The commenter (3702.1) also states that mitigation policies

may contribute to or exacerbate international conflicts by, for example, raising food prices (one consequence of biofuel mandates already witnessed); causing relocation of manufacturing activity to unstable countries; sparking trade wars as a result of taxes or tariffs intended to discriminate against energy intensive products; and increasing energy prices around the world, which will likely slow economic growth in unstable countries.

The commenter further states that EPA does not weigh the potential impacts of climate change with the “foreseeable climate change responses.”

**Response (8-24):**

First, it is important to note that the commenter mischaracterizes Dr. Fingar's testimony (Fingar, 2008). The full quoted sentence from his testimony reads as follows:

Government, business, and public efforts to develop mitigation and adaptation strategies to deal with climate change—from policies to reduce greenhouse gases to plans to reduce exposure to climate change or capitalize on potential impacts—may affect US national security interests even more than the physical impacts of climate change itself.

Thus, Dr. Fingar's statement refers to adaptation and mitigation measures as well as strategies to capitalize on potential (presumably beneficial) impacts—not mitigation, or GHG reduction, policies only as the commenter asserted.

In a broader sense, EPA is not aware of any instance in the peer-reviewed assessment literature where it is stated that national security impacts could be minimized by not taking any mitigation action—which appears to be what the commenter is implying. We note that the commenter did not submit or cite any literature to support this assertion. By way of an example of the current consensus, the report CNA (2007) cited in the TSD, in addition to describing projected impacts to national security from climate change, makes numerous recommendations for action (including mitigation and adaptation efforts) to reduce these projected national security impacts. EPA therefore does not find support for the commenter's implication that we should assume that the secondary effects of mitigation measures and policies would be worse than the projected national security impacts in the absence of such actions.

Finally, with regard to the commenter's request that we weigh the potential impacts of climate change with the foreseeable responses, see the Findings, Section III.C, "Adaptation and Mitigation," for our response to comments on and treatment of adaptation and mitigation in the Findings.

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**Comment (8-25):**

Several commenters (1529, 1564, 2147) state their support for the Findings, noting the threat of increased world conflict due to drought, crop impacts, and population displacement. One of these commenters (2147) shares his experience of living in the Sahel Region of Niger, West Africa, including the devastating effects of seasonal fluctuations on food security, access to clean water, prevalence of disease, and infant mortality, citing relevant concerns about potentially more severe impacts from global warming. One commenter (3062) notes that climate change will be a national security, public health, and social justice problem, not just environmental. One commenter (2818) states that climate change threats to security also pose a "very grave risk to our health." The commenter further asserts that environmental resources are very likely to become scarcer as climate changes, which will pose both global security threats as well as security threats to the United States.

**Response (8-25):**

We agree with the commenters that the literature states that projected impacts of climate change may pose a threat to U.S. national security. We note that the Administrator considered these issues as part of the endangerment finding; see Section IV.B, "The Air Pollution is Reasonably Anticipated to Endanger Both Public Health and Welfare," of the Findings.

We also agree that some of the national security threats that climate change may be a contributor to include resource scarcity and public health threats. As stated in Fingar (2008):

From a national security perspective, climate change has the potential to affect lives (for example, through food and water shortages, increased health problems including the spread of disease, and increased potential for conflict), property (for example through ground subsidence, flooding, coastal erosion, and extreme weather events), and other security interests.

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### **8.3 Impacts in Other World Regions**

**Comment (8-26):**

One commenter (3394.1) argues that EPA's analysis of the international impacts of climate change is "wholly unscientific" and cannot, therefore, provide support for a positive endangerment finding. The commenter makes three arguments to support this. First, the commenter states that climate change impacts to foreign nations are "not directly relevant to an endangerment assessment." Second, the commenter states: "EPA's attempt to tie foreign effects to the United States by noting the potential international trade effects of climate change fails because, as EPA concedes, '[t]here is currently a lack of information about how these potential impacts in other regions of the world may influence international trade and migration patterns'." Finally, the commenter criticizes the sources used for the TSD's discussion of the national security impacts of climate change.

**Response (8-26):**

Section 16 of the TSD relies on the latest USGCRP assessment report, Karl et al. (2009), multiple chapters of the IPCC Fourth Assessment Report, published studies on the national security implications of climate change, and expert testimony. Like the rest of the TSD, it provides references for each major

conclusion. Subsection 16(b), an overview of the projected international impacts associated with elevated atmospheric GHG concentrations, is based primarily on the IPCC Fourth Assessment Report and includes multiple references to eight separate chapters from the report, each of which synthesize hundreds of individual studies. See Section III.A., “The Science on Which the Decisions Are Based,” for our response to comments on the use of the assessment literature and our treatment of new and additional scientific literature provided through the public comment process.

With regard to the commenter’s first argument, please see Volume 9 of this Response to Comments document for our response to comments regarding the global and domestic scope of the endangerment finding. Please see Section III.D, “Geographic Scope of Impacts,” and Section IV.B.2., “The Air Pollution Is Reasonably Anticipated to Endanger Public Welfare,” of the Findings for our response to broader legal and policy comments raised regarding international impacts.

With regard to the second argument, we disagree that the foreign effects of climate change are not relevant to the United States, and we also disagree that the TSD failed to adequately demonstrate their relevance. The body of literature summarized in the TSD provides compelling evidence that climate change poses serious risks for other world regions, especially those that face greater impacts because they are more vulnerable. It also provides evidence that impacts of climate change in other world regions could, in turn, create economic, trade, humanitarian, and national security issues for the United States.

We further note that we have revised the TSD to include the findings of the recently published USGCRP synthesis report (Karl et al. 2009), which further confirm these concerns. The report states (and the TSD now includes) the following, with respect to effects due to climate change impacts in other world regions:

Meeting the challenge of improving conditions for the world’s poor has economic implications for the United States, as does intervention and resolution of intra- and intergroup conflicts. Where climate change exacerbates such challenges, for example by limiting access to scarce resources or increasing incidence of damaging weather events, consequences are likely for the U.S. economy and security.

With respect to international trade and migration, we note that the TSD quotation referenced by the commenter does not state that international trade and migration patterns will not be affected by climate change. Rather, it states that there is currently a lack of information about precisely how they may be affected. The fact that we cannot with current tools project exactly how international trade and migration will be affected by climate change does not imply that they can not or will not be significantly affected. To further clarify the likelihood that climate change could affect trade and migration, we have added the following paragraph to the TSD:

While there is currently a lack of information about how, precisely, impacts due to climate change may influence international trade and migration patterns, there is considerable evidence that they will be affected. The USGCRP (Karl et al., 2009) has concluded that the numbers of people wanting to immigrate to the United States will increase as conditions worsen elsewhere and that climate change has the potential to alter trade relationships by changing the comparative trade advantages of regions or nations. Shifts in both trade and migration can have multiple causes and the direct cause of potential increased migration, such as extreme climatic events, will be difficult to separate from other forces that drive people to migrate (USGCRP, 2009).

Based upon this, we find that climate change impacts in foreign countries can clearly impact the United States through international trade and migration. The discussion of international impacts in the TSD is reasonable and accurately reflects the literature.

With regard to the commenter's third argument, please see Section 8.2 of this volume for our response to comments regarding the national security impacts of climate change.

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**Comment (8-27):**

One commenter (5844) states that the proposed finding “largely glosses over and ignores a tremendous list of impacts to human health and welfare around the globe... Food shortages, drought, mass migration, war, rising seas, threats to trade, economic dislocations, global pandemics, and increased weather disasters offer a short list of international vectors for indirect impacts on U.S. health and welfare.” The commenter asserts that impacts in other world regions should be fully enumerated and evaluated in order to estimate the indirect impacts to the United States of climate change affecting other nations, which alone “would satisfy the [Clean Air Act's] human health and welfare tests for endangerment.”

**Response (8-27):**

We agree that numerous international impacts are projected to occur as a result of climate change, and that indirect impacts to the United States may result. We describe these projected impacts in Section 16 of the TSD. For example, the TSD quotes Karl et al. (2009) in stating that:

In an increasingly interdependent world, U.S. vulnerability to climate change is linked to the fates of other nations. For examples, conflicts or mass migrations of people resulting from food scarcity and other resource limits, health impacts, or environmental stresses in other parts of the world could threaten U.S. national security.

Please see Section IV.B.2.h, “Impacts in Other World Regions that Can Affect the U.S Population,” for a description of EPA's consideration of international impacts in the finding.

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**Comment (8-28):**

Several commenters state that specific aspects of the climate impacts evidence summarized in the TSD with respect to impacts in other world regions do not support the Administrator's endangerment finding.

**Response (8-28):**

The specific issues that underlie these comments are addressed in the responses throughout this volume, and other volumes of the Response to Comments document. With regard to the commenters' conclusion that the current science does not support an endangerment finding with respect to impacts in other world regions, we disagree based on the scientific evidence before the Administrator. See the Findings, Section IV.B, “The Air Pollution is Reasonably Anticipated to Endanger Both Public Health and Welfare,” for details on how the Administrator weighed the scientific evidence underlying her endangerment determination in general, and with regard to the impacts in other world regions sector in particular.

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**Comment (8-29):**

A commenter (3440.1) argues that EPA said the Ganges delta will be affected by rising sea levels but failed to point out that the land area of Bangladesh, on the Ganges delta, has increased by 70,000 square kilometers (sq. km) over the past 30 years, suggesting that sea level is not rising much there. The commenter further argued as follows: “You [the EPA] say that ‘global warming’ has been described as a ‘national-security threat-multiplier’. How can it be, when there has not been any statistically significant ‘global warming’ for 15 years, and when - on the calculations we have already outlined - there is no

reason to suppose that there will be any significant ‘global warming’ from anthropogenic causes in the future?”

**Response (8-29):**

The commenter did not provide a reference for the claim that the land area of Bangladesh has increased by 70,000 sq. km in the past years, and we were not able to confirm this number in a peer-reviewed assessment. However, Nicholls and Goodbred (2004) note that the observational database for the delta is poor and that a number of important questions about the delta evolution and the relative roles of natural and anthropogenic subsidence and sedimentation remain to be resolved.

Even if the size of the Ganges delta had increased in size over the past 30 years, it would not automatically follow that “sea level is not rising much there” because potential changes in sedimentation could temporarily counteract the effects of sea level rise in some areas. According to the IPCC, sea level rise along the East Asia coast has been geographically variable but uniformly positive, with rates ranging from 1.5 to 4.4 millimeters per year (mm/yr) (Cruz et al., 2007). Cruz et al. (2007) further notes that climate change and sea level rise will tend to worsen the currently eroding coasts; that projected sea level rise could flood the residence of millions of people living in the low-lying areas of South, Southeast, and East Asia, such as in Bangladesh; and that even under the most conservative scenario, sea level will be about 40 centimeters (cm) higher than today by the end of the 21<sup>st</sup> century, which is projected to increase the annual number of people flooded in coastal populations from 13 million to 94 million. The Ganges-Brahmaputra delta has the largest population of 40 deltas identified worldwide, with over 1 million people at risk of being potentially displaced and directly affected by current sea level trends by 2050 (Cruz et al., 2007).

Please see Volume 2 of this Response to Comments document for our response to comments on observed temperature change. Please see Volume 3 of this Response to Comments document for our response to comments on attribution. Please see Volume 4 of this Response to Comments document for our response to comments on future projections of temperature change.

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**Comment (8-30):**

A commenter (2876) expresses support for the findings and notes that climate change and high temperatures limit the amount of water available to residents of low-income countries, resulting in human and animal deaths.

**Response (8-30):**

We agree that water stress is projected to occur in some areas, including numerous developing countries, as a result of climate change, and describe this threat in Section 16 of the TSD. Please see Section IV.B.2.h, “Impacts in Other World Regions that Can Affect the U.S Population,” for a description of EPA’s consideration of international impacts in the Findings.

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**Comment (8-31):**

Several commenters (0731, 3461.1, 4817, 11427) voice their support for EPA’s Proposed Findings due to concern about environmental refugees, or people that are displaced by catastrophic weather events. The commenters believe the numbers of environmental refugees will increase, putting pressure on limited local resources. One commenter estimated that rising sea levels will displace hundreds of millions of people in other regions worldwide such as Bangladesh, Philippines, Indonesia, Pakistan, India, the Egyptian Nile Delta, and the Brazilian Amazon Basin.

**Response (8-31):**

We agree with the commenters that increased migration may result from climate change. We have revised the TSD to include the following statement from Karl et al. (2009) regarding migration impacts on the U.S., including national security impacts:

In an increasingly interdependent world, U.S. vulnerability to climate change is linked to the fates of other nations. For examples, conflicts or mass migrations of people resulting from food scarcity and other resource limits, health impacts, or environmental stresses in other parts of the world could threaten U.S. national security.

We have also revised the TSD to include the following:

The USGCRP (Karl et al., 2009) concluded that the number of people wanting to immigrate to the United States will increase as conditions worsen elsewhere, and that climate change has the potential to alter trade relationships by changing the comparative trade advantages of regions or nations. Shifts in both trade and migration can have multiple causes and the direct cause of potential increased migration, such as extreme climatic events, will be difficult to separate from other forces that drive people to migrate (Karl et al., 2009).

Please see Section IV.B.2.h, “Impacts in Other World Regions that Can Affect the U.S Population,” for a description of EPA’s consideration of international impacts in the Findings.

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## **8.4 Vulnerable Populations**

**Comment (8-32):**

A number of commenters (e.g., 2818, 2895, 3195.1, 3338.1, 3402, 3422, 3895, 6809, 7021, 9450, 10126) point out that climate change disproportionately affects vulnerable populations. A commenter (3422), for example, states: “The impacts of climate change will be felt most acutely by those living in poverty and other vulnerable populations in the US and around the world.” Another commenter (7021) states that the elderly, infants, those with impaired health, the homeless, low-income people, and others who have limited access to health care and other resources are particularly vulnerable to extreme weather events.

Some commenters provide reference documents to support their arguments regarding disproportionate impacts. A commenter (3338.1) references several studies (Morello-Frosch et al., 2009; GAO-05-289, 2005; Jacobson, 2008) in support of a statement that EPA should find that GHGs endanger public health and welfare in part because of their adverse health and welfare impacts on poor and minority communities. Another commenter (3248) submits a paper (Costello et al., 2009) that focuses on managing the health effects of climate change and includes an analysis of impacts on vulnerable populations.

**Response (8-32):**

First, we note that climate change impacts vary significantly between and within regions on the basis of complex and interacting physical, economic, social, and political factors, such that particular groups that may experience disproportionate impacts in one area may not necessarily experience the same impacts in another. In general, however, we fully agree, and the assessment literature strongly supports, that certain vulnerable populations tend to experience disproportionate risks and impacts from climate change.

Taken as a whole, the studies on observed and projected impacts of climate change synthesized in the assessment literature clearly indicate that the harmful effects of climate change will tend to fall most

heavily on certain parts of the population, both domestically and globally. The TSD summarizes this information, noting the following for the United States:

- The CCSP reports that climate change has the potential to accentuate the disparities already evident in the American health care systems, as many of the expected health effects are likely to fall disproportionately on the poor, the elderly, the disabled, and the uninsured.
- Within settlements experiencing climate change, certain parts of the population may be especially vulnerable; these include the poor, the elderly, those already in poor health, the disabled, those living alone, and/or indigenous populations dependent on one or few resources (Wilbanks et al., 2008). Notably, vulnerable groups represent a more significant part of the total population in some regions and localities than others (Karl et al., 2009).

EPA has reviewed the studies referenced by commenters to support their arguments regarding disproportionate impacts. We find that the studies referenced by commenters are directionally consistent with the assessment literature summarized in the TSD. EPA concludes that the TSD's summary of the current state of the science on this topic as reflected in the assessment literature is reasonable and sound.

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**Comment (8-33):**

Many commenters (e.g., 2818, 2895, 3195.1, 3402, 3422, 3895, 6809, 7021, 9450, and 10126) state that the impacts of climate change on vulnerable populations demand action to reduce GHG emissions and protect vulnerable populations from harmful effects. A commenter (7021), for example, states that “[i]t is an ethical imperative that we do all we can now to protect those in our society who will be most vulnerable to climate change.”

**Response (8-33):**

See Section III.C, “Adaptation and Mitigation,” of the Findings for our response to comments on the treatment of adaptation and mitigation in the Findings.

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**Comment (8-34):**

Two commenters (3195.1, 2895) focus specifically on threats posed by climate change to the well-being of Native American tribes. A commenter (2895), for example, asserts that the ability of Native American tribes to sustain their culture is severely threatened by climate change. The commenter states: “Their rights to traditional resources are fixed to their reservations, trust lands, and some federal lands. Tribal members cannot move to escape climate change without losing their rights to hunt, fish, track, harvest and gather, and losing their connections to their ancestors and ancient stories. And as they remain, climate change is pulling the ecological rug from under them.” Another commenter (3195.1) makes a similar point, stating: “The greenhouse gases referred to under the proposed findings—carbon dioxide, hydrofluorocarbons, methane, nitrous oxide, perfluorocarbons and sulfur hexafluoride—endanger public health and welfare, and in particular are highly injurious to the many tribal communities in our nation and the world.” These commenters state that responses to climate change should take these unique risks into account.

**Response (8-34):**

We agree that certain Native American tribes, particularly those who are dependent on one or a few natural resources, possess unique vulnerabilities to the risks of climate change (Karl et al., 2009; Field et al., 2007; ACIA, 2004). Impacts are summarized in the TSD and are part of the information the Administrator drew upon in her endangerment analysis. Regarding the comment about responses to climate change, please see Volume 11 of this Response to Comments document.

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**Comment (8-35):**

Several commenters (2895 and 6809) focus especially on the particular risks children face due to climate change. A commenter (2895), for example, states that children “are at greater exposure given their nervous systems and their time spent outdoors, their greater sensitivity to certain exposures from environmental toxins caused from climate change, and their dependency on caregivers for appropriate preparedness and response.”

**Response (8-35):**

For EPA’s responses to comments and literature provided on children’s health issues in the TSD, please see Volume 5 of the Response to Comment document.

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**Comment (8-36):**

Several commenters state that it is important to consider the impacts of climate change on vulnerable populations in determining appropriate responses. A commenter (2895), for example, states: “We must consider the impacts on the poor and disenfranchised as we look for ways to respond to climate change.” A commenter (4154) states that socio-economic data for Council of Energy Resource members and other tribes shows that they are among the poorest populations in the U.S. and states: “It would be grossly inequitable to subject the Indian Tribes to a set of restrictions designed for an affluent, high greenhouse gas emission society when the Tribes are, in fact, more accurately analogized to a developing country. EPA should endeavor to design its regulatory program in a manner sensitive to these concerns so that Indian Tribes will be able to grow their economies and provide their members with a standard of living in parity with prevailing national averages.”

**Response (8-36):**

The issues raised by the commenters regarding the economic impacts of mitigation measures are not relevant to the endangerment determination, but would be addressed in other actions, as appropriate. See our response on this issue in Volume 11 of the Response to Comments document.

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**Comment (8-37):**

Several commenters (3214.2, 3477, 3507.2, 4395, 5787, and 11047) state that EPA should not make an endangerment finding in part or in whole because such an action would disproportionately and adversely impact minorities, the poor, and/or indigenous populations. A commenter (3214.2), for example, states that based on its own careful analysis of this action and its likely impacts on American businesses, jobs, minorities, low- and fixed-income families, and others, EPA should not make an endangerment finding or promulgate these proposed rules because such an action would “have disproportionate impacts on minorities and would violate civil rights and accepted standards of science, economics and environmental justice.” Another commenter (3477) states: “Indigenous populations life expectancies continue to improve through their use of carbon based energy. Energy use allow for adaptation. Restricting energy usage through this endangerment finding will actually negatively impact the poor and indigenous populations to a greater degree.”

**Response (8-37):**

See Section III.C, “Adaptation and Mitigation,” of the Findings for our response to comments on the treatment of adaptation and mitigation in the Findings. The issues raised by the commenters regarding the economic impacts of mitigation measures are not relevant to the endangerment determination, but would be addressed in other potential actions, as appropriate. See Volume 11 of this Response to Comments

document with regard to the economic implications. Note that this action does not impose any standards, regulations or restrictions.

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**Comment (8-38):**

Several commenters (1556, 1620, 1807, 3331, 3461.1, 3565.1, 3566.1, 3768, 3986, 7137, 8560, and 11422) voice their support for EPA’s Proposed Findings on the grounds that global warming will not affect all people equally and may “exacerbate social and racial disparities.” The commenters cite a number of examples, including the sensitivity of children to pollutants and their reliance on others in extreme weather events, as well as the high risk to the elderly and the poor during extreme heat events. The commenters state that global warming will also disproportionately affect those that are unable to move away from areas where the effects of global warming are greatest, including individuals who live in coastal regions. Two commenters conclude that the “disproportionate and discriminatory impacts” on vulnerable populations make climate change one of the “most significant environmental justice issues of our time.”

**Response (8-38):**

We agree that climate change presents risks and impacts to certain vulnerable populations. See Volume 5 of this Response to Comments document for EPA’s responses to comments on specific aspects of climate risks to public health.

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**Comment (8-39):**

Commenter (3344.2) submits an 87-page report entitled *As Goes the Arctic, So Goes the Planet* (Karnik, 2008) as evidence that climate change will disproportionately affect indigenous communities of Alaska and the Arctic. The report is also a formal petition to EPA for rulemaking under the Clean Air Act to regulate greenhouse gas emissions from mobile and stationary sources to protect the health and welfare of the Arctic and the world.

**Response (8-39):**

We have reviewed the report submitted by the commenter. The report states that climate change directly impairs the health and cultural identity of Arctic residents in numerous ways. We agree that climate change presents risks and impacts to certain vulnerable populations, including indigenous communities in Alaska. As we state in the Findings: “Climate change will likely interact with and possibly exacerbate ongoing environmental change and environmental pressures in settlements, particularly in Alaska where indigenous communities are facing major environmental and cultural impacts on their historic lifestyles.” Regarding the commenter’s petition for rulemaking, this specific petition is not being addressed in these Findings. See Volume 5 of this Response to Comments document for EPA’s responses to comments on specific aspects of climate risks to public health.

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**Comment (8-40):**

One commenter (3768) states that the “effects of climate change will be felt most significantly by the poor, contributing to political instability.”

**Response (8-40):**

We agree that climate change presents risks and impacts to certain vulnerable populations, and that climate change could contribute to political instability. As stated by CNA (2007) and quoted in the TSD: “Projected climate change will seriously exacerbate already marginal living standards in many Asian,

African, and Middle Eastern nations, causing widespread political instability and the likelihood of failed states.”

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