Discussion of scientific support and analysis.

The NPRM fails to articulate the process by which the Administrator came to the conclusion on p. 30, line 41-46:

> "The Administrator believes that the scientific findings in totality point to compelling evidence of human-induced climate change, and that serious risks and potential impacts to public health and welfare have been clearly identified, even if they cannot always be quantified with confidence. The Administrator's proposed endangerment finding is based on weighing the scientific evidence, considering the uncertainties, and balancing any benefits to human health, society the environment that may also occur."

The finding document remains very separate from the TSD, with only occasional references to the IPCC or particular CCSP report findings, and it is up to the reader's interpretation of the TSD to determine how the evidence has been weighed to arrive at the conclusions above. The finding rests heavily on the precautionary principle, but the amount of acknowledged lack of understanding about basic facts surrounding GHGs seem to stretch the precautionary principle to providing for regulation in the face of unprecedented uncertainty. (The TSD notes several areas where essential behaviors of GHGs are "not well determined" and "not well understood" (e.g., why have U.S. methane levels decreased recently?).) This could be remedied by expanding the discussion on pp. 25-31 to articulate more clearly how the Administrator weighed the scientific evidence related to each impact or how/whether she gave more or less weight to particular impacts for either the public health or the welfare finding and how she weighed uncertainty in her deliberations.

For example, the NPRM and TSD outline the following 5 human health effects from climate change: temperature effects, air quality changes, extreme events, climate-sensitive diseases and aeroallergens. It is unclear whether temperature effects will result in net mortality increases or decreases and the scientific literature does not provide definitive data or conclusions about aeroallergen impacts. Further, the impact of climate-sensitive diseases may be minimal in a rich country like the US.

Hence, it seems that the Administrator's public health endangerment conclusion is based on the other two impacts, with the most significant health risks being posed by air quality changes. If so, the discussion here should state this explicitly. Further, the argument for why the increases in ozone from climate change pose a health impact could be fleshed out more thoroughly (p. 27, line 34-39). Since tropospheric ozone is already regulated under the Clean Air Act, EPA should explain why those regulations are inadequate to protect public health from the ozone impacts of climate change.

In addition, the finding could be strengthened by including additional information on benefits, costs, and risks (where this information exists); meeting appropriate standards for peer review; and accepted research protocols. Some issues to cover that would address costs, benefits, and risks include the following:

- Methodology or methodologies used for weighing risks and various outcomes and the risks associated with each;
- Confidence intervals related to model results at the regional and local scales;
- Underlying assumptions of findings, publications on which the findings are based, and "business-as-usual" scenarios;
- Quality and homogeneity of temperature data from surface networks that may affect estimates of past temperature trends, and calibration and verification of models;
- Impacts of climate change on the value of net economic benefits.

The Finding should also acknowledge that EPA has not undertaken a systematic risk analysis or cost-benefit analysis.

In the absence of a strong statement of the standards being applied in this decision, there is a concern that EPA is making a finding based on (1) "harm" from substances that have no demonstrated direct health effects, such as respiratory or toxic effects, (2) available scientific data that purports to conclusively establish the nature and extent of the adverse public health and welfare impacts are almost exclusively from non-EPA sources, and (3) applying a dramatically expanded precautionary principle. If EPA goes forward with a finding of endangerment for all 6 GHGs, it could be establishing a relaxed and expansive new standard for endangerment. Subsequently, EPA would be petitioned to find endangerment and regulate many other "pollutants" for the sake of the precautionary principle (e.g., electromagnetic fields, perchlorates, endocrine disruptors, and noise).

Endangerment without consideration of regulatory consequences.

EPA should explain whether it considered a finding that methane and the other four non-CO2 GHGs do in fact contribute to climate change, based on their higher warming potential, but that overriding policy concerns make such a finding infeasible concerning CO2. Because methane and the other four non-CO2 GHGs are either already regulated under the CAA or are functionally equivalent to pollutants typically regulated under the CAA, an endangerment finding for these GHGs would be relatively routine. Because GHGs are understood to be long-lived, well-mixed in the atmosphere, and generated by many nations around the globe, the most analogous regulatory approach for controlling GHGs would seem to be Title VI of the CAA. EPA's relevant experience with controlling ozone-depleting substances should inform its decisions on an approach to regulating GHGs.

In contrast, an endangerment finding under section 202 may not be not the most appropriate approach for regulating GHGs. Making the decision to regulate CO2 under the CAA for the first time is likely to have serious economic consequences for regulated entities throughout the U.S. economy, including small businesses and small communities. Should EPA later extend this finding to stationary sources, small businesses and institutions would be subject to costly regulatory programs such as New Source Review.

The role of mitigation, adaptation, and/or benefits of climate change
To the extent that climate change alters our environment, it will create incentives for innovation and adaptation that mitigate the damages from climate change. The document should note this possibility and how it affects the likely impacts of climate change.

For example, climate change is likely to unfold slowly and people may migrate from hot regions (e.g., Arizona) to more temperate regions (e.g., Minnesota) and this would mitigate the adverse impacts on health (although people would incur migration costs). Further, climate change is likely to lead to innovation that mitigates the ozone related health impacts; it seems reasonable to assume that in the absence of regulation of GHS, new medicines that lessen the health impacts of ozone will be developed. Moreover, advances in technology and the development of public health programs (e.g., cooling centers) are likely to lessen the negative welfare impacts of heat waves.

Similarly, the document would appear more balanced if it also highlighted whether particular regions of the US would benefit, and to what extent these positive impacts would mitigate negative impacts elsewhere in the United States. For example, it might be reasonable to conclude that Alaska will benefit from warmer winters for both health and economic reasons. Deschenes and Moretti (2007 *Review of Economics and Statistics*) demonstrate that extremely cold days are more dangerous to human health than extremely hot days. Please add this paper to the literature review in Section 7(a) of the TSD.

Further, there should be a consideration of the fertilizing effect of CO2, which may overwhelm the negative impact of additional hot days on agricultural yields in some regions of the US. In others regions, the net effect is likely to be negative.

Agency compliance with other environmental mandates
There is some concern that an endangerment finding, and some of the language used to support the finding, will make it more difficult to comply with NEPA and other environmental planning statutes.

- This finding and the associated emission standards for these six greenhouse gases may make it much more expensive and difficult to develop other air quality standards (NAAQS in particular). For example, EPA has recently asked BLM to use models that sometimes exceed current budgets in developing resource management plans and environmental impact statements. Also, there are currently no models available that forecast the potential impacts of greenhouse gases on climate change at the regional or local level, which are the levels at which our decisions are made. This rule also could make findings that would leave agencies vulnerable to litigation alleging "inadequate NEPA" due to new information (i.e., the endangerment finding) that was not considered when the EIS was developed. Without a model available, an agency would be left with little ability to respond because (i) there are no standards to serve as thresholds, (ii) there are no tools to analyze impacts, and (iii) the cost of analyzing impacts could be exorbitant.

- Unnecessarily broad or expansive language with respect to the effects of GHGs or the certainty with which effects will occur could create a basis for finding all GHG emissions significant for purposes of NEPA analysis, thus requiring an EIS for all direct and indirect effects that change GHG emissions in any amount. Similarly, EPA should be very careful to state which effects are significant and their scale to avoid unintentionally trigger NEPA for Federal actions not otherwise considered to have environmental impacts.

Four chemicals v. six chemicals

EPA proposes to make an endangerment finding on six directly emitted and long-lived GHGs—carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride, treated as a group as an air pollutant. The proposal, however, defines the terms "air pollution" and "air pollutant" for purposes of section 202(a) as the six GHGs, two of which are not addressed in the underlying petition and which EPA recognizes are not emitted by new motor vehicles or motor vehicle engines, and on page two, this action is characterized as a "response" to the Supreme Court's decision in Massachusetts v. EPA, 549 U.S. 497 (2007), which arose from a petition with respect to the four GHGs. Although the latter two GHGs have similar characteristics and are addressed in UN documents, it is not clear why they are included in the endangerment and "cause or contribute" findings. While it appears that section 202(a) provides sufficiently broad authority for EPA to do so and the draft explains this decision as based on the uniform, global nature of GHG ambient concentrations, a seemingly simpler regulatory action might be to base the definition of "air pollution" or "air pollutant" on the four GHGs emitted by new motor vehicles or motor vehicle engines.

- This raises the question of the extent to which EPA intends or does not intend this finding to extend beyond section 202 to the same terms used in other key parts of the CAA, e.g., section 101(a) (general findings and purpose), section 108 (National Ambient Air Quality Standards), and section 111(b) (New Source Performance Standards). EPA would benefit from making its position explicit in this proposal. Commenters are sure to take this important issue on in some fashion so EPA may as well do what it can to shape the debate and the comments being invited. For example, it could note that the same terms are important parts of other key CAA provisions, but then state that EPA at this time is only addressing and seeking comment on issues directly associated with section 202. Alternatively, it could state that it views these findings as to GHGs to be broadly applicable to the Act as a whole, but nonetheless make clear that EPA is not in this rulemaking attempting to consider or address any of the other regulatory findings that would be necessary to trigger GHG regulation under other CAA programs. A third option would be to invite comment on whether interested parties believed there was any basis for distinguishing the understanding of the terms in the section 202 context from the understanding of the terms in other parts of the Act.

- EPA fails to make a case of why the six GHGs should be treated as a single pollutant and why all six should be treated as a group. Treating the gases as a group yields the indefensible result that emissions of PFCs, SF6 and HFCs other than HFC-134a from motor vehicles are asserted to "cause or contribute: to air pollution, when there are no such emissions from motor vehicles. Further, EPA states that: "Depending on the circumstances... it may be appropriate to set standards for individual gases [of the 6], or some combination of group and individual standards." EPA asserts that these regulatory flexibilities would exist whether or not greenhouse gases are treated as multiple pollutants or as individual pollutants. [See discussion on page 32-33.]

- These greenhouse gases differ significantly in terms of physical properties, formation mechanisms, and possible mitigation techniques.

  - Mobile source CO_2 is formed by burning fossil fuels. Virtually all of the carbon in the fuel is converted to CO_2. The more efficient the combustion process, the more complete the conversion to CO_2. Unlike for traditional criteria pollutants (*e.g.*, NMHC, CO, NO_X), which can be converted to other substances through emissions aftertreatment (*i.e.*, catalytic converters), no mobile aftertreatment device can convert CO_2 to something that does not contribute to global warming.[1] Therefore, mobile source CO_2 emissions can only be reduced by burning less fossil fuel, either by improving fuel economy or converting to less carbon-intensive fuels.

  - Mobile source CH_4 and N_2O emissions are by-products of fossil fuel combustion. However, burning less fossil fuel does not necessarily mean reducing CH_4 and N_2O emissions. For example, using methane (CH_4) rather than petroleum could increase CH_4 emissions

  - Mobile source HFC emissions arise from releases of HFC refrigerants from mobile air conditioners. Therefore, mobile source HFC emissions can only be reduced by using different refrigerants and/or "hardening" mobile air conditioners to reduce the potential for refrigerant leaks.

  - Mobile source CO_2, CH_4, N_2O, and HFC emissions not only have different global warning potentials, they remain in the atmosphere for different amounts of time and are removed from the atmosphere by different mechanisms.

- In contrast to EPA's citation of Class I and Class II substances under Title VI, under Title II, EPA's treats mobile source NHMC and NO_X as separate pollutants, even though both are precursors to the formation of tropospheric ozone (i.e., urban smog), and both are mitigated through a combination of fuel improvements,

[1] In fact, current catalytic converters operate by convert HC, CO, and NO_X into CH_4, N_2O, and CO_2 (and water).

> combustion process changes, and emissions aftertreatment. Considering that mobile source CO_2, CH_4, N_2O, and HFC emissions are even more distinct from one another than are mobile source NHMC and NO_X emissions, and that EPA classifies NMHC and NO_X as separate pollutants, EPA should classify these as separate pollutants or, alternatively, classify CO_2 as one pollutant, classify CH_4 and N_2O as another pollutant (class), and classify HFCs as a third pollutant (class).

Accounting for the Global Nature of Greenhouse Gas Pollution in the Findings

In this draft proposal, EPA finds under Clean Air Act (CAA) section 202(a) that (1) "air pollution" in the form of the global mix of six greenhouse gases (or the GHGs) may be reasonably anticipated to endanger public health and welfare (the endangerment finding); and (2) emissions of an "air pollutant" in the form of the global mix of the GHGs from new motor vehicles or motor vehicle engines cause or contribute to that air pollution (the contribution finding). The agency characterizes the "global" nature of the GHG emissions and concentrations (page 16), notes the effects of GHG emissions globally in making the endangerment finding (page 29), and assesses the contribution of the GHGs emitted by section 202(a) sources as a percentage of global emissions (page 36). The proposal appears to assume, but does not explicitly discuss why (or solicit comment on whether) these are relevant legal inquiries under section 202(a) the Clean Air Act. This is virtually certain to be a subject of public comment; and we recommend that EPA directly address this matter in the proposal.

EPA also factors international considerations into the endangerment and contribution findings differently. On page 29, the agency states: "The Administrator judges that impacts to public health and welfare occurring within the U.S. alone warrant her proposed endangerment finding." On page 36, however, EPA bases its finding on the "significance" of the GHG emissions from section 202(a) sources for purposes of the contribution finding in part on their global contribution:

> It is the Administrator's judgment that the collective GHG emissions from section 202(a) source categories are significant, whether the comparison is global (over 4 percent of total GHG emissions) or domestic (24 percent of total GHG emissions). The Administrator believes that consideration of the global context is important for the cause or contribute test but that the analysis should not solely consider the global context.

It is unclear from the proposal why a difference in treatment of the two findings is necessary or appropriate. Because the Administrator regards the domestic contribution comparison in itself to be significant, it may be simpler (and less open to challenge) to base the contribution finding solely on domestic considerations. (This would not foreclose a discussion of global contribution, provided, as requested above, it is made clear how relevant this is under section 202(a)).

Group Versus Individual Approach to "Air Pollutant"

On page 32, EPA proposes to designate the six GHGs, collectively, as the "air pollutant" for which the endangerment finding is being made. The proposal, however, then goes on at pages 33-40 to analyze the contribution issue both as to the six GHGs collectively, and as to each individually. Although EPA hints that it believes either a collective or individual approach could be valid and would reach similar results, see page 34, the agency never really says expressly whether or not it is soliciting comment on these issues and whether it would be open to considering a pollutant-by-pollutant-based approach for the final rule. We recommend that this be made explicit.

Comment Solicitation

EPA limits solicitation of comment on the proposal to the simple statements on page six to the effect that it seeks comment on all aspects of this action (data, methodology, and major legal and policy considerations). While this is efficient and legally sufficient, the agency may want to highlight a few key areas in which comment would be most useful. The first two issues that we've identified above might be worthy of an express request for comment. EPA may also need to clarify the relationship between comment on this proposal and the July 30, 2008 Advance Notice of Proposed Rulemaking on Greenhouse Gas Emissions (ANPR). In footnote 11, EPA indicates that it is responding to a few key comments from the ANPRM in this proposal related to the endangerment and contribution findings and asks commenters to "submit to the docket for today's action any comments they want EPA to consider as it makes a decision on this proposed determination." We recommend that EPA move the footnote 11 discussion up to the main body of the proposal at page 6 and explicitly state that commenters may not rely on prior submission of comments to the ANPR and that if parties wish EPA to consider comments made in response to the ANPR or other rulemakings, they should re-submit those comments here with an appropriate explanation as to how the commenter believes those comments relate to issues raised in this proposal. We can imagine a party trying to make out a challenge to this endangerment finding based on arguments that were raised entirely or primarily in comments submitted in response to the ANPR, not this proposal (a prospect that is somewhat more likely due to the fact that EPA in various places discusses comments made in response to the ANPR).

Agricultural Production

The proposed Finding erroneously suggests that Intergovernmental Panel on Climate Change (IPCC) predicts an increase in both crop and forest production in the U.S. (e.g., pg. 28 lines 21 and 34 of the Proposed Finding, pg 80 line 26, page 87 line 9). The IPCC findings refer to North America, not the U.S.

The Synthesis and Assessment Product 4.3 (SAP 4.3) "The Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity in the United States" (U.S. Climate Change Science Program/Backlund et al. 2008), which includes more recent and more geographically-specific publications, tempered IPCC's findings substantially, citing water limitations, northward progression of production zones, diminished grain set period, pest infestations, nutrient limitations, air pollution, and wildfire, among other dampening factors to production in agriculture and forestry in the

U.S. Significant increases in production may be possible within North America as a whole, but are unlikely within the U.S. itself.

The Findings document should be corrected to reflect that IPCC is referring to North America rather than the U.S. More importantly, the Findings document should be revised to accurately reflect the discussion in the Technical Support Document (TSD).

In addition, the placement of the IPCC prediction near the beginning of each section in the absence of any summarization gives the impression that large production increases are conclusive. This overrides the very salient and far more equivocal discussion which follows, leaving readers with the mistaken impression that climate change is a boon to U.S. agriculture and forestry. A summary statement which more accurately reflects the content of the technical discussions should be composed to lead each section.

Emissions from the combustion of different fuels vs. emissions from different mobile source categories.

Mobile source CO_2 is formed by burning fossil fuels. Virtually all of the carbon in the fuel is converted to CO_2. Therefore, and considering that CO_2 remains in the atmosphere for a long time, national aggregate consumption of different types of fuels provides the most accurate basis for estimating CO_2 emissions.

IPCC guidelines for national reporting of GHG emissions account for this fact, and EIA and EPA both use fuel consumption—not vehicle sales and fuel economy—as a basis for estimating and reporting CO_2 emissions. According to the IPCC (emphasis added), "Emissions of CO_2 are best calculated on the basis of the amount and type of fuel combusted (**taken to be equal to the fuel sold**, see section 3.2.1.3) and its carbon content."[2]

Such reporting addresses petroleum consumption in the aggregate and for different petroleum-based fuels, such as shown below from EIA (http://www.eia.doe.gov/oiaf/1605/ggrpt/carbon.html):

[2] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_3_Ch3_Mobile_Combustion.pdf, p. 3-10.

Table 5. U.S. Carbon Dioxide Emissions from Energy and Industry, 1990, 1995, and 2000-2007
(Million Metric Tons Carbon Dioxide)

Fuel Type or Process	1990	1995	2000	2001	2002	2003	2004	2005	2006	P2007
Energy Consumption										
Petroleum	2,178.8	2,206.1	2,459.0	2,470.2	2,467.7	2,512.4	2,602.8	2,619.9	2,596.2	2,579.9
Coal	1,799.9	1,898.9	2,146.4	2,084.4	2,094.1	2,131.3	2,157.6	2,161.2	2,139.8	2,162.4
Natural Gas	1,033.6	1,193.0	1,239.8	1,189.3	1,245.7	1,212.6	1,194.2	1,182.5	1,158.9	1,237.0
Renewables[a]	6.3	10.5	10.6	11.2	13.1	11.8	11.5	11.6	11.8	11.6
Energy Subtotal	**5,018.7**	**5,308.5**	**5,855.8**	**5,755.1**	**5,820.6**	**5,868.1**	**5,966.2**	**5,975.3**	**5,906.7**	**5,990.9**
Nonfuel Use Emissions[b]	*98.8*	*105.5*	*110.6*	*105.8*	*106.2*	*103.9*	*112.1*	*107.0*	*111.5*	*117.6*
Nonfuel Use Sequestration[c]	*251.2*	*286.5*	*308.2*	*293.8*	*293.9*	*289.6*	*311.9*	*302.3*	*302.0*	*301.5*
Adjustments to Energy	-82.4	-62.4	-60.9	-45.3	-37.8	-28.3	-44.3	-46.5	-66.8	-74.2
Adjusted Energy Subtotal	**4,936.3**	**5,246.0**	**5,794.8**	**5,709.9**	**5,782.8**	**5,839.7**	**5,921.9**	**5,928.9**	**5,839.9**	**5,916.7**
Other Sources	85.1	102.3	97.8	97.0	97.7	98.9	102.0	103.4	105.9	105.1
Total	**5,021.4**	**5,348.4**	**5,892.6**	**5,806.9**	**5,880.5**	**5,938.7**	**6,023.9**	**6,032.3**	**5,945.8**	**6,021.8**

[a]Includes emissions from electricity generation using nonbiogenic municipal solid waste and geothermal energy.
[b]Emissions from nonfuel uses are included in the energy subtotal above.
[c]The Btu value of carbon sequestered by nonfuel uses is subtracted from energy consumption before emissions are calculated.
P = preliminary data.
Notes: Data in this table are revised from the data contained in the previous EIA report, *Emissions of Greenhouse Gases in the United States 2006*, DOE/EIA-0573(2006) (Washington, DC, November 2007). Totals may not equal sum of components due to independent rounding. Adjusted energy subtotal includes U.S. Territories but excludes international bunker fuels.
Source: EIA estimates.

General Editorial issues

"New Motor Vehicle or Motor Engine" Reference. The draft sometimes simply refers to emissions from "motor vehicles" rather than emissions from "new motor vehicles or motor vehicle engines." (The draft could indicate initially that the term "motor vehicle" is intended to refer to both of these.)

Statements regarding consideration of current and near-term emissions [page 35], and cumulative emissions [page 17] appear to be inconsistent, and should be clarified.

EPA clearly intends that the definition of the "air pollutant" emitted by new motor vehicle or motor engine sources to be the six GHGs. In several places, however, the proposal appears to describe the four GHGs emitted by new motor vehicles or motor vehicle engines as the "air pollutant." See, e.g., pages 1 (lines 36-37), 2 (lines 24-27), and 36 (lines 34-37).