

Author's response to reviews

Title: On estimating the ancillary human health benefits of improved air quality resulting from climate change mitigation

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Author's response to reviews: see over

Response to Reviewer Comments

Environmental Health

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On estimating the ancillary human health benefits of improved air quality resulting from climate change mitigation

Michelle L Bell, Devra L Davis, Luis A Cifuentes, Alan J Krupnick, Richard D Morgenstern and George D Thurston

We thank the reviewers for their insightful comments and have revised the paper in accordance with their suggestions. The following details how we addressed each specific point. Original reviewer comments are in italics.

Reviewer's report

Title: *A framework for estimating the ancillary human health benefits of improved air quality resulting from climate change mitigation*

Version: *1* ***Date:*** *9 June 2008*

Reviewer: *Nino Kuenzli*

Reviewer's report:

This is a timely and interesting review of current approaches taken to understand at list parts of a more complex issue, mainly greenhouse gas reduction strategies and its relation with air quality and, thus, health. The paper highlights inconsistencies across approaches taken so far, which all amplify the inherent uncertainties related to such estimation endeavours.

While I have no specific comments to the well done review sections, I identify some mismatch between the promising broad title and the more restricted area addressed in the paper itself. The title is more comprehensive than the paper but it would be very interesting to comply with the promises. The missing aspect is described below:

The framework is to a large extent based on the assumption that GHG mitigations result in ancillary benefits due to improvements in air quality. In my opinion, these boundaries of the framework are too narrow and result in an incomplete framework, view, and debate. While I fully agree that the most efficient and attractive GHG mitigations would be those that result, at the same time, in reduced air pollution, it is unfortunately not a given that this will be the case. The manuscript shortly refers to tradeoffs, but in general, the paper is written under the premise of ancillary benefits.

If the authors want to address the problem the title implies I suggest to give further thoughts and summaries about the tradeoffs, and to revise the respective sections to make it more explicitly applicable to scenarios where GHG mitigations are not or negatively correlated with air pollution mitigations, thus resulting in additional costs rather than health benefits. It would be good to be comprehensive on these issues for the key path of action addressed in this manuscript, mainly GHG versus air pollution.

It would be nice to see these (GHG / air quality) tradeoffs reviewed to the extent available, and to have the authors come up with a discussion of those tradeoffs. Let me mention just a few of the more obvious dynamics to make the point clear that GHG and clean air policies not to be “linearly correlated” by default:

- *The increase in urban density can be an urban planning strategy to reduce transport-related GHG production. This may well result – at least for many years to come – in a larger number of people being exposed to high levels of pollution or even in an absolute increase in air pollution in such urban areas, unless ancillary strategies are implemented specifically under a clean air (rather than GHG) policy perspective.*
- *Alternative vehicles are available that consume less fuel, namely motorcycles, which have seen an enormous revival in some areas of the world. The current fleet of these vehicles is far less clean than modern cars, thus a source of high pollution, typically occurring in proximity to large numbers of people.*
- *Along the above lines of thoughts, bikes could be an excellent element in GHG-mitigation strategies in urban areas around the world. Without drastic changes in urban planning and car fleets, this may however result in an increase of peoples (bikers) exposure (or dose) to toxic substances and accidents.*
- *The sudden move toward a ‘biofuel’ economy runs under the label of GHG-mitigation strategies. It has by no means been paralleled by a comprehensive assessment of its effects on air quality and health, and it should not be taken as a given that these “GHG-mitigations” to be a benefit for air quality or health while GHG may be reduced – not to speak about the profound implications of the “biofuel” economy on the costs of basic foods with all its deleterious health effects among the socially deprived populations and regions in the world.*
- *The “diesel tradeoff” has been mentioned and it certainly belongs to this list of what is sold as GHG policies while conflicting with air pollution mitigation. • Like some of the above examples already show, it is rather likely to see many more lobbies “highjacking” policies under the currently fashionable GHG perspective while being ignorant about the ancillary costs and health hazards. Some of the latter may be more immediate and more certain than the projected GHG benefits. Only a comprehensive estimation framework will detect such tradeoffs.*

While not a necessity for this manuscript, it could be emphasized that climate change and its mitigations have far broader implications, thus, while GHG and air pollution mitigations may come with parallel benefits, a range of “ancillary actions” and GHG-related changes may have profound and complex implications on all aspects of key elements of the proposed framework, namely GHG, air quality, and health. These ‘externalities’ of the framework may be important and add uncertainty to the framework itself. E.g., as heat waves increase, production and use of air conditioners may (or did) go up dramatically. While this may increase GHG (if energy is produced with fossil fuels) and deteriorate ambient air quality, it may reduce health problems among the users of air conditioners, given healthier temperatures and indoor air quality.

In summary, I think an “estimation framework” is very much needed, but it should not be restricted to the scenario of a positive correlation between GHG and air pollution mitigation. It would be welcomed to see the complexities of the latter relationship being addressed in the paper rather than to change the title and some wording to keep the paper within the current borders of a scenario that implies a positive correlation between the two.

Level of interest: *An article of importance in its field*

Quality of written English: *Acceptable*

Statistical review: *No, the manuscript does not need to be seen by a statistician.*

We agree that the paper focuses on benefits, and has not given sufficient attention to potential negative consequences, such as those outlined in the reviewer's examples. We changed the title to remove the word "framework," which may have overstated our work. In the title we maintained language that alerts the reader to the issues we are addressing (only the human health benefits of improved air quality from climate change mitigation.)

The ancillary studies we identified in a literature review have focused on the benefits, and have not addressed the broader set of consequences as described by the reviewer. We added text to explicitly note that while our paper and existing research address benefits, there could be negative consequences as well, and we provide some specific examples. The new text to highlight the reviewer's point is in the Discussion Section:

"This work has focused primarily on health benefits from improved air quality resulting from climate change mitigation, however a full assessment of the short-term consequences of climate change policies would incorporate tradeoffs that may in fact be negative or for which the direction of impact is difficult to predict." (page 23, 2nd paragraph)

"As another example, GHG mitigation might incorporate policies to deter suburban sprawl, which could reduce transportation-related air emissions and thereby improve health in the short-term. However, a fuller understanding of the consequences of such a policy would address changes in population-weighted air pollution exposure, which may be higher in urban areas, as well as urban crime, and other potential impacts from higher population density. Other examples are transition to biofuels, which could have implications for nutrition, or the use of bikes rather than cars for transportation, which would lower air pollution emissions but could potentially also harm health if biking occurred near major roadways, increasing proximity to high pollution at an increased ventilation rate or could improve health through increased exercise. Thus, while our discussion and most research of ancillary consequences have focused on benefits, a full suite of positive and adverse consequences could exist." (page 23, 3rd paragraph)

Reviewer's report

Title: *A framework for estimating the ancillary human health benefits of improved air quality resulting from climate change mitigation*

Version: *1* ***Date:*** *26 June 2008*

Reviewer: *Colin L C Soskolne*

Reviewer's report:

I WOULD LIKE TO SEE SOME MINOR REVISIONS THAT ADDRESS/INCLUDE THE FOLLOWING:

1. SCIENTIFIC AMERICAN, JUNE 2008, BY JOHN BROOME, PP. 97-102, CONTAINS AN ARTICLE ABOUT "THE ETHICS AND ECONOMICS OF CLIMATE CHANGE: BALANCING CURRENT COSTS AGAINST FUTURE WELL-BEING". IT DIRECTLY ADDRESSES HOW DISCOUNTING EVALUATES FUTURE GOODS AND WHY ETHICS IS SO IMPORTANT TO THIS DISCUSSION (OF ECONOMICS) BECAUSE IT FORCES ONE TO BE EXPLICIT ABOUT ONES VALUES AS THEY RELATE TO DISCOUNTING THE FUTURE FOR PRESENT BENEFIT. THIS PAPER OUGHT ALSO

TO REFLECT THIS THINKING/DISCUSSION. JOHN BROOME'S NAME SHOULD APPEAR IN THE REFERENCE LIST.

Thank you for bringing this reference to our attention. It was not available at the time of our original submission. We added a paragraph to discuss these issues and added this reference to the “Credibility of economic valuation estimates” section. The new text is as follows:

“In addition to the issues of credible economic evaluation of the benefits and costs of climate change policies, a central issue in comparing these values is the discount rate applied [134]. Selection of the discount rate, which accounts for differential value of costs and benefits occurring in the far future compared to those taking place in the present or near future, can greatly alter results of cost benefit analysis, such as for climate change. In fact, a recent disagreement regarding climate change policy analysis by two leading economists centered largely on the use of a different discount rate [11, 134]. While some aspects of benefit/cost analysis are well-suited to monetary terms, the issue of an appropriate discount rate carries ethical implications regarding the relative impacts on various populations.” (Page 21, 2nd paragraph)

2. I WOULD HAVE EXPECTED THIS PAPER TO REFLECT ON THE EFFECT OF SEPTEMBER 11, 2001'S AIRPORT CLOSURE AND NO-FLIGHT POLICY FOR A FEW DAYS ON VARIOUS MEASURES OF AIR QUALITY. THIS IS SOME EXCELLENT EMPIRICAL EVIDENCE OF THE EFFECT ON AIR QUALITY OF REDUCED (ELIMINATED?) AIR TRAFFIC.

Due to space considerations, we are prohibited from referencing the wealth of scientific literature on air pollution and health. We choose to focus on those studies that have been utilized in climate change ancillary benefits studies (see Table 2), which includes over 40 individual references. We also cite a textbook on air pollution and health that provides general information on the scientific literature (Holgate et al. 1999).

From an epidemiological standpoint, evaluating the health impacts of September 11 are difficult to apply to “real-world” situations as many factors other than air pollution were altered (e.g., peoples’ activity patterns), thus we have omitted this discussion from our paper. However, we are glad to add related references if the reviewer wishes to suggest specific articles.

3. THE NOTION OF "VOLUNTARY SIMPLICITY" SHOULD BE ACKNOWLEDGED IN THIS PAPER AS A SIMPLE WAY OF ACHIEVING KYOTO-TYPE TARGETS THAT, WHILE UNDERMINING GDP, WOULD ADD TO OTHER MEASURES OF ECONOMIC WELL-BEING SUCH AS THE GENUINE PROGRESS INDICATOR AND/OR THE GENUINE WEALTH INDICATOR.

Our paper and the ancillary studies we identified in a literature review focus on climate change mitigation through government policies, particularly at the federal level. However, we agree that other types of actions, such as voluntary measures at the personal level, could potentially be examined as could local efforts. We added text to make this point,

and added four new references relating to climate change mitigation actions at the community level, household level, and the individual level. The new text is:

“While most ancillary studies to date have examined policies at the federal level, in theory analysis could examine the impacts of other mitigation actions such as those conducted at the local level [44, 45] or even personal choice and household level actions [46, 47] that aggregated lead to lower GHG emissions.” (page 8, 1st paragraph).

AS A MINOR EDITORIAL NOTE, I WOULD LIKE THE AUTHORS NOT TO USE "METHODOLOGIES" WHEN THEY IN FACT MEAN "METHODS". "METHODOLOGIES" REFERS TO "THE STUDY OF METHODS".

We changed “methodologies” to “methods” everywhere it appears in the paper.

ON PAGE 12, LINE 3, THE WORD "IN" IS MISSING.

We made this correction.

ON PAGE 13, NINE LINES FROM THE BOTTOM, INSTEAD OF "LOSS OF" RATHER USE "REDUCTION IN".

We made this change.

ON PAGE 21, LINE 4, THE WORD "IN" IS MISSING.

We made this correction.

Level of interest: An article of importance in its field

Quality of written English: Acceptable

Statistical review: No, the manuscript does not need to be seen by a statistician.