UNHEALTHY EXAGGERATION

The WHO report on climate change

Indur M Goklany

The Global Warming Policy Foundation

GWPF Briefing 13

GWPF REPORTS

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About the author

Indur Goklany is an independent scholar and author. He was a member of the US delegation that established the IPCC and helped develop its First Assessment Report. He subsequently served as a US delegate to the IPCC, and an IPCC reviewer. He is a member of the GWPF's Academic Advisory Council.

Summary

In the run-up to the UN climate summit in September 2014, the World Health Organization (WHO) released, with much fanfare, a study that purported to show that global warming will exacerbate undernutrition (hunger), malaria, dengue, excessive heat and coastal flooding and thereby cause 250,000 additional deaths annually between 2030 and 2050. This study, however, is fundamentally flawed.

Firstly, it uses climate model results that have been shown to run at least three times hotter than empirical reality (0.15°C vs 0.04°C per decade, respectively), despite using 27% lower greenhouse gas forcing.

Secondly, it ignores the fact that people and societies are not potted plants; that they will actually take steps to reduce, if not nullify, real or perceived threats to their life, limb and well-being. Thus, if the seas rise around them, heatwaves become more prevalent, or malaria, diarrhoeal disease and hunger spread, they will undertake adaptation measures to protect themselves and reduce, if not eliminate, the adverse consequences. This is not a novel concept. Societies have been doing just this for as long as such threats have been around, and over time and as technology has advanced they have gotten better at it. Moreover, as people have become wealthier, these technologies have become more affordable. Consequently, global mortality rates from malaria and extreme weather events, for instance, have been reduced at least five-fold in the past 60 years.

Yet, the WHO study assumes, explicitly or implicitly, that in the future the most vulnerable populations – low income countries in Africa, Europe, southeast Asia and the western Pacific – will not similarly avail themselves of technology or take any commonsense steps to protect themselves. This is despite many suitable measures already existing – adapting to sea level rise for example – while others are already at the prototype stage and are being further researched and developed: early-warning systems for heatwaves or the spread of malaria or steps to improve sanitation, hygiene or the safety of drinking water.

Finally, the WHO report assumes, erroneously, if the IPCC's Fifth Assessment Report is to be believed, that carbon dioxide levels above 369 ppm – today we are at 400 ppm and may hit 650 ppm if the scenario used by the WHO is valid – will have no effect on crop yields. Therefore, even if one assumes that the relationships between climatic variables and mortality used by the WHO study are valid, the methodologies and assumptions used by WHO inevitably exaggerate future mortality increases attributable to global warming, perhaps several-fold.

1 Introduction

A recent WHO study[1] – henceforth, WHO (2014) – claims that between 2030 and 2050, climate change is (sic) 'expected'[2] to cause approximately 95,000 deaths per year from malnutrition in children under 5 years, 60,000 deaths from malaria, 48,000 from diarrhoea in children under 15 years, and 38,000 from heat stress in the elderly, for a total of approximately 250,000 deaths from just these four causes.[3]

This briefing paper identifies some of the shortcomings of the WHO estimates of mortality from global warming. Because of these shortcomings, WHO (2014) substantially overstates the future mortality from any such warming.

Firstly, the WHO analysis uses climate model results that have been shown to be unable to predict global temperature changes. Their results are based on the so-called A1b scenarios for future carbon dioxide emissions, which project a temperature increase of 0.14°C from 2000 to 2010 and 0.15°C per decade from 1990 to 2010.[4] However, according to the IPCC, empirical data (based on UK Met Office's HadCRUT4 temperature database) indicates that from 1998–2012 the globe warmed at less than one-third that rate, at just 0.04°C per decade.[5] This, despite the fact that the actual anthropogenic effective radiative forcing – a measure of the strength of the greenhouse gas effect at the top of the atmosphere – is estimated to be 36% greater than what was used in the A1b scenario for 2010 (2.25 vs 1.65 $\mathrm{W\,m^{-2}}$).[6] That is, the A1b scenario uses lower greenhouse gas forcing yet manages to overestimate the warming trend three-fold or more.

Secondly, consider that in a mere span of 12 years, from 2000 to 2012, global death rates from diarrhoea, malaria and undernutrition declined by 40%, 42%, and 28%, respectively.[7,8] On longer time frames, say, 60 years, the reductions are even more astonishing. For example, they were reduced by 80% for malaria and 95% for all extreme weather events.[9,10]

These reductions are a product of the fact that, unless inhibited by institutions or excessive costs, human beings will employ whatever machines, techniques, management methods, knowledge or other skills (collectively labelled 'technology') that they can access or invent in order to reduce adverse impacts, whatever their cause. In other words, to adapt is human nature; it is business as usual. But because human nature asserts itself all the time, human beings and their societies adapt perpetually. With the march of time, existing technologies spread more widely through societies, becoming cheaper and more effective.[11] Concurrently, new technologies come on line. In addition, as societies become wealthier, they are better able to afford these new and improved technologies. Consequently, any analysis of future impacts should in-

Table 1: Adaptation assumptions used in the models in the WHO study

	Underlying trends	**Adaptation assumptions included in model**	**Potential options not included in model**
Heat-related mortality in elderly people	Population growth and ageing; improved health in elderly people due to economic development	Three levels of autonomous adaptation assumed – none, partial and full – based on shifts to optimum temperature	Improved heat health protection measures; early warning systems
Coastal flooding	Coastal population increase; increased vulnerability due to rapid urban development, which then declines	Evolving coastal protection measures	Population relocation
Diarrhoeal disease	Improved mortality outcomes due to technology (sic)[a] and economic development	None	Improved water, sanitation and hygiene
Malaria and dengue	Assumed reductions in mortality rates (sic)[b] resulting from socioeconomic development	Assumed reductions in mortality rates[b] resulting from socioeconomic development	Specific novel interventions, e.g. vector control, vaccination, early warning systems
Undernutrition	Population growth; improved population health due to technology (sic)[a] and economic development	Crop yield models include adaptation measures	Non-agricultural interventions, e.g. water and sanitation provision; reduced meat consumption in countries with currently high consumption.

(a) Technological change was ignored for Africa and other low income countries.[13]. (b) WHO's methodology reduced the population at risk of malaria due to socioeconomic development, but not the mortality rate for the population at risk.[14]. Source: WHO (2014), p. 6, Table 1.1

corporate adaptation and the fact that adaptive capacity increases with both economic development and secular technological change, for which time is a proxy.[12] Ignoring adaptation and increases in adaptive capacity over time could, over the span of decades, overestimate impacts several-fold. For example, if one were to start with a baseline malaria death rate from 1950 but ignore adaptation since that time, then malaria mortality in the 2010s would be overestimated five-fold. Applying a similar methodology for extreme weather events would lead to a twenty-fold overestimate if one used the 1940s mortality rate as the baseline. Unfortunately few, if any, assessments of the impacts of global warming fully consider adaptation and improvements in adaptive capacity with both time and economic development. As a result, the negative impacts of global warming will almost inevitably be much lower than is estimated by these impacts assessments. The WHO study is no exception. In fact, by WHO's own admission, its estimates ignore commonsense adaptations that virtually any individual or society should be expected to undertake were they to believe they would be adversely affected by the impacts of global warming, particularly if they were wealthier, as is assumed in the A1 emissions scenarios. Table 1 reproduces verbatim the first four columns of Table 1.1 from the WHO study. The reader's attention is directed particularly to the last column in the table, which lists potential options that were not included in the WHO's exercise. I will eschew discussion of how completely this column lists adaptations that might reasonably be expected to be available by 2050.

The notes to the table also identify the effect of some of the methodological choices made in the WHO study about the extent to which economic development and/or technological change were considered in attenuating mortality. The table indicates that the WHO assumed that individuals and societies would not, for instance, relocate from the coastline in response to the encroachment by the sea or increases in the frequency of coastal flooding that ought to occur if sea levels were, in fact, to rise per the A1b scenario. This is implausible, especially considering that many measures to cope with these problems effectively are already well known, available and tested in coastal areas around the world.

So is the assumption that individuals and societies would not improve water supplies, sanitation or hygiene, despite the toll of diarrhoeal diseases and the increasing ability to afford such measures. Similarly, the notion that early-warning systems will not be employed for alerting populations to heatwaves, malaria and other vector-borne diseases is risible in this day and age considering the increasing prevalence of mobile phones, the Internet, Twitter and apps for virtually any application imaginable, and the easy availability of satellite observations and improved meteorological forecasts.

As noted elsewhere,[15] the numbers of cell phone and Internet users are skyrocketing. This is true even in sub-Saharan Africa, where numbers of mobile phone subscribers have increased from zero in 1990 to 38% of the population in 2009 and 66% in 2013.[16] Similarly, Internet users have increased from 0% in 2009 to 7% in 2009 and 17% in 2013.[17] In today's interconnected world, early-warning systems will quite likely be developed spontaneously through informal networks, even if they are not sponsored by governments or other centralized agencies. In fact, mobile-phone-based and other early-warning systems already exist in many developing countries[18] and are being researched and developed further, for example for cyclones in Bangladesh[19] and for malaria in east Africa.[20] It is no less remarkable that WHO (2014) did not consider 'specific novel interventions, e.g. vector control' for malaria. Is there no likelihood of progress in this regard over the next 35 years?

The following sections identify additional critical flaws in WHO's methodologies for what they claim are the two largest contributors to future mortality from global warming: undernutrition and malaria.

2 Mortality from undernutrition

In addition to using climate change estimates from models that run too hot, estimates of mortality from undernutrition are based on estimates of crop yields (and therefore production) that ignore the direct effects of carbon dioxide on raising agricultural yields. These effects include increases on both plant growth rate and the efficiency with which plants use water. Specifically, the WHO study relies on a paper by Nelson et al.,[21] which notes that (emphasis added):

> The analysis reported here uses ... [an] atmospheric concentration of CO_2 in 2050 set at 369 ppm. This amount is substantially less than the level predicted by most of the GHG scenarios. However, for this analysis, the only use of CO_2 concentrations is as part of the crop modeling, and *the model response to CO_2 is likely to be overstated* .[22]

While acknowledging that higher carbon dioxide levels would stimulate plant growth, it argues in a footnote that:

> [Long et al. (2006)] finds that the effects in the field are approximately 50 percent less than in experiments in enclosed containers. And another report (Zavala et al. 2008) finds that higher levels of atmospheric CO_2 increase soybean plants' susceptibility to the Japanese beetle and maize susceptibility to the western corn rootworm. Finally, a 2010 study (Bloom et al. 2010) finds that higher CO_2 concentrations inhibit the assimilation of nitrate into organic nitrogen compounds... [Also], when nitrogen is

> limiting, the CO_2 fertilization effect is dramatically reduced. So the actual benefits in farmer fields of CO_2 fertilization remain uncertain. Furthermore, we do not model the effects of ozone damage or increased competition from pests and diseases that seem likely in a world with higher temperatures and more precipitation. So we justify our use of the 369 ppm modeling as an imperfect mechanism to capture these effects.[23]

However, this rationalization overlooks the fact that, even assuming Long et al.'s estimate of 50% is accurate, there is a big difference between an effectiveness of 50% for CO_2 levels above 369 ppm versus, as Nelson et al. assume, 0% above 369 ppm.[24] Secondly, addressing pests, diseases and nutrient limitations are routine challenges for farmers and should be *easier* for them to address as society becomes more affluent and technology continues to advance.[25] Moreover, higher carbon dioxide levels should reduce ozone damage to crops because such increased levels reduce the size of stomata and this then reduces the exchange of ozone and other gases into and out of the plants, which should reduce ozone damage.[26]

Notably, the IPCC's latest report states,

> Field experiments provide a direct evidence of increased photosynthesis rates and water use efficiency (plant carbon gains per unit of water loss from transpiration) in plants growing under elevated CO_2. These physiological changes translate into a broad range of higher plant carbon accumulation in more than two-thirds of the experiments and with increased net primary productivity (NPP) of about 20 to 25% at double CO_2 from pre-industrial concentrations.[27]

Assuming crop yields increase linearly with increasing carbon dioxide concentrations, crop production under the A1b scenario should be 15–19% higher in 2050 than estimated by Nelson et al.

Yet another source of overestimation is that to estimate mortality from undernutrition in children under 5 years, the WHO developed relationships using regression analyses between mortality and a set of independent socioeconomic variables, namely:

- GDP per capita
- years of education at age 25 years (a proxy for human capital)
- time (a proxy for health benefits arising from technological developments).[28]

But then it effectively freezes technology at the 1990 level for Africa and other lesser developed areas and ignores technological change thereafter (emphasis added):

> The projection regression equations were recalibrated so that back projections of child-mortality rates to 1990 matched observed trends for World Bank regions. In the recalibrated projections, the regression coefficient for human capital was left unchanged and *the regression coefficient for time (a proxy for technological change) was set to zero for low-income countries* in the WHO African, European, South-East Asia and Western Pacific regions.[29]

But these are precisely the areas where the vast majority of mortality from undernutrition would occur. The same flawed methodology is applied for mortality from higher temperatures and diarrhoeal diseases.[30]

3 Mortality from malaria

The WHO study estimates malaria mortality by first dividing the world into grid cells and then developing a regression relationship between the population at risk in each grid cell at present[31] (the independent variable) and three dependent variables:

- the mean temperature of the coldest month
- the mean precipitation of the wettest month
- GDP per capita (also for the same grid cell)

Notably, time – a proxy for secular technological change – is not one of the dependent variables.[32] For future years, the climatic variables were obtained from (flawed) climate models, and the population and GDP estimates from the A1b scenario. These were then plugged back into the regression equation to calculate the populations at risk. Then

> …to calculate mortality associated with malaria infections, national current malaria mortality estimates were multiplied by the national ratio of the projected population at risk to the present population at risk.[33]

In other words, if a person was at risk of malaria in 2050, then that person is equally likely to die from malaria (in 2050) as in the present. This is implausible, to say the least. To summarize, this methodology ignores secular technological change from 2007 onward that would otherwise reduce the population at risk and the fraction of that population that would die from malaria. It also ignores any socioeconomic developments since 2007 that would reduce mortality within the population at risk.

4 Conclusion

Even if one assumes that the relationships between climatic variables and mortality used in this study are valid, considering the cumulative effect of the shortcomings noted above, the methodologies and assumptions used by the WHO inevitably exaggerate the future mortality increases attributed to global warming, perhaps several-fold.

Notes

1. WHO, Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s. WHO, 2014. Available at http://www.who.int/globalchange/publications/quantitative-risk-assessment/en/.
2. The use of the word 'expected' implies far more certainty than is warranted, as this briefing shows.
3. WHO, Climate change and health, Fact sheet No. 266. WHO, 2014. Available at http://www.who.int/mediacentre/factsheets/fs266/en/.
4. IPCC AR5 2013 WG1, p. 1445.
5. IPCC AR5 2013 WG1, p. 769.
6. IPCC AR5 WG1, Annex II: 1435.
7. WHO, Disease and injury regional mortality estimates, 2000–2012. WHO, 2014. The paper can be downloaded from: http://www.who.int/healthinfo/global_burden_disease/estimates/en/index1.html.
8. WHO, Fact Sheet on the World Malaria Report 2013. WHO, 2013. Available at http://www.who.int/malaria/media/world_malaria_report_2013/en/.
9. Roll back malaria. World Health Report 1999. WHO, 1999
10. Goklany IM, Wealth and safety: the amazing decline in deaths from extreme weather in an era of global warming, 1900–2010. Reason Institute, 2011.
11. Goklany IM, Integrated strategies to reduce vulnerability and advance adaptation, mitigation, and sustainable development, *Mitigation and Adaption Strategies for Global Change*, 2007 DOI 10.1007/s11027-007-9098-1.
12. Ibid.
13. WHO, Quantitative risk, p. 102.
14. WHO, Quantitative risk, p. 52.
15. Goklany IM, Is climate change the number one threat to humanity? *Wiley Interdisciplinary Reviews: Climate Change*, 2012; 3: 489–508.
16. World Bank, World Development Indicators, at http://databank.worldbank.org/data/views/reports/tableview.aspx#, visited November 2, 2014.
17. Ibid.
18. Zschau J and Küppers AN. *Early Warning Systems for Natural Disaster Reduction*. Springer, 2003
19. Uddin MR, Awal MA, Early warning on disastrous weather through cell phone, *IOSR Journal of Computer Engineering* 2013; 11: 51–53.
20. Githeko AK et al. Development and validation of climate and ecosystem-based early malaria epidemic prediction models in East Africa. *Malaria Journal* 2014; 13: 329.
21. Nelson G et al. Food security, farming, and climate change to 2050. Washington, DC: International Food Policy Research Institution, 2010.
22. Ibid, p. 14.

23. Ibid.
24. Note that in 2050, atmospheric CO_2 concentration should be approximately 650 ppm per the A1b scenario, 75% higher than the assumed 369 ppm. See WHO, Quantitative Risk Assessment, Op. cit., p. 98.
25. Goklany, Is climate change the number one threat. Op. cit.
26. Taub DR, Effects of rising atmospheric concentrations of carbon dioxide on plants, *Nature Education Knowledge* 2010; 3: 21.
27. IPCC AR5 WG1, p. 501.
28. WHO, 'Quantitative risk assessment', op cit.
29. WHO, 'Quantitative risk assessment', op cit., p. 102.
30. WHO, 'Quantitative risk assessment', op cit., pp. 21, 42, 71.
31. Defined as 2007 – see WHO, 'Quantitative risk assessment', op cit., p. 52.
32. Goklany, 'Integrated strategies'.
33. WHO, 'Quantitative risk assessment', op cit., p. 10.

GWPF BRIEFINGS

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Our main focus is to analyse global warming policies and their economic and other implications. Our aim is to provide the most robust and reliable economic analysis and advice. Above all we seek to inform the media, politicians and the public, in a newsworthy way, on the subject in general and on the misinformation to which they are all too frequently being subjected at the present time.

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Published by the Global Warming Policy Foundation

For further information about GWPF or a print copy of this report, please contact:

The Global Warming Policy Foundation
10 Upper Bank Street, London E14 5NB.
T 020 7006 5827
M 07553 361717

www.thegwpf.org

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