**Review of “Climate Change Impacts” by Givewell**

The paper begins by stating that “Climate change would have extraordinarily negative humanitarian impacts across all of the outcomes (…): hunger, flooding, extreme weather, health, biodiversity, and the economy”, but at the next paragraph concludes that “Under the economic growth scenarios the [IPCC AR4] report considers, it looks like the world will be substantially better off on average, and in today's low income countries in particular, in 2100 than today, even after accounting for the negative effects of climate change”. This is an obvious fallacy, and the mechanical result of scenario assumptions that the authors of this paper misinterpreted entirely. First, ALL the scenarios defined by the IPCC in 1997 assume a positive economic growth for the period 2000-2100, ranging from “very high” to “medium”. As a result, it is not surprising that global GDP in 2100 would be higher than in 1990 or 2000! However, the authors keep comparing, throughout the paper, the situation in 2100 vs. 1990, when the correct comparison, if any, should be drawn between different scenario outcomes at the same point in time, e.g. A1 in 2100 vs. B2 in 2100. Second, none of the scenarios present a counterfactual, i.e. there is no “mitigation” scenario or “business as usual” scenario. The closest we can get to something similar would be to look at the sub-scenarios in A1 (A1T vs. A1FI respectively), but the authors show results only for some sub-scenarios. Consequently, it is hard to make ANY meaningful conclusion on the impacts of climate change based on the numbers presented (e.g. tables on p. 3 and p.5).

Page 3: The last paragraph states that: “*We struggled to make sense of the humanitarian impact of things like "hundreds of millions of people exposed to increased water stress" and "changed distribution of some disease vectors." Accordingly, we decided to pick the five impacts described in the summaries that seemed most worrisome to us to explore and summarize ourselves in somewhat greater depth.”*

This sounds disingenuous at best. Both the IPCC AR4 and the Stern review warn that most of the adverse impacts of climate change, especially for the most vulnerable people, will be mediated through water. Thus, excluding this aspect from a consideration of the humanitarian effects of climate change is arbitrary and misleading. The authors should also include some factors to qualify how they characterise impacts as “worrisome”.

We review all the five impacts considered:

**1) Crop productivity and hunger in Africa**

Page 4: There are no quantitative estimates given that show hunger levels in Africa are driven by socio-economic growth than by climate change and hunger declines relative to 2020. In fact, IPCC (2007), WGII projects that:

1. by 2020 between 75 and 250 million could be exposed to increased water stress due to climate change.
2. Agricultural productivity could be severely compromised by climate variability and change affecting food security and malnutrition, with yield from rain fed agriculture reduced by up to 50% by 2020.

 Page 5: Paragraph 1 states that “hunger declines substantially by 2080 relative to 2000” – as discussed above, this is NOT a relevant comparison. We need to compare the results in 2080 under different scenarios. If we do that, as the authors recognize in paragraph 3, we find that “Climate change is predicted to lead to substantially greater levels of hunger than would occur otherwise”. Therefore, their conclusion that climate change should not be a big worry in terms of its effects on hunger and the world’s poor, is especially surprising. As for the statement in Paragraph 1 that “Across all scenarios, hunger is expected to decline as a proportion of the population”, this is again just a mechanical effect of the scenario assumptions, which (rightfully) couple high economic growth with low population growth. In fact, the only scenario that assumes high population growth is A2, which is shown to generate by far the highest level of persistent hunger in 2080 compared to the other scenarios (3-8 times as high as in the other cases).

1. **Floods due to rising sea levels**

Page 6: Concluding that in all scenarios but A2 that the number of people flooded per year in the 2080 due to sea level rise from climate change is less than in 1990 is not correct, as no data was available for 1990 for Asia and Africa. The data suggests that in 2080 for the two scenarios with sea-level rise greater than 0.25 m, (A1F1 and A2), the increase in coastal-flood victims in Asia is 1 to 7 million on an annual average and 2 to 7 million in Africa. The global total indicates the increase in coastal flood victims on an annual basis is expected to range from 2 to 34 million for all scenarios considered (A1F, A2, B1 and B2) compared to 1990. Note that sea level rise is expected to be exacerbated in the long-term, closer to 2100 and thus comparing to 1990 baselines is not particularly meaningful. As stated earlier, it is more meaningful to compare against a range of BAUs in 2080 with and without climate change mitigation. And it is equally important to include the costs associated with coastal flooding before suggesting that economic effects from climate change are not consequential. The paper does not integrate costs associated with climate change when making inferences on damage inflicted due to climate change.

1. **Increasing frequency of extreme weather (e.g. hurricanes and heat waves)**

Page 8: The main conclusion drawn is that there is less confidence in stating that “the effect of growth and climate change on extreme weather related human impacts” are likely to be positive. The authors do not dispute the fact that extreme weather impacts on human not negligible.

1. **Adverse effects on health status**

Page 8: The authors acknowledge that heat-related deaths are expected to increase in the future by 2080. In the case of malaria, the suggestion that population growth alone is a significantly larger factor for increased risk of malaria rather than climate change is not supported by the data in van Lieshout et al. (2004, table 2). The data there suggests that the additional population at risk of malaria for greater than 1 month range between 220 to 400 million across the world, for the four scenarios considered (A1F1, A2, B1 and B2). The greatest additional populations at risk are in East and Southern Africa, West Asia and East Asia. Thus, while South Asia may have additional risks from malaria occurring because of population growth and not necessarily climate change, other areas appear to be more susceptible. An inference that population growth and not climate change leads to increased risks of malaria transmission is not robust as a conclusion. Van Lieshout et al. state that the while climate induced changes in temperature and precipitation can increase distribution and transmission of malaria in poor and vulnerable regions, it is in the poorest countries that climate change does not affect malaria transmission. Again, the costs from increased population at risks for malaria transmission due to climate change are not discussed in the study.

Page 9: Paragraph 4 states that: “Absent conclusive evidence in either direction, and based on the track record of malaria control in the developed world, we would expect that the health benefits of economic growth will outstrip the negative health effects caused by climate change.” This also seems like a fallacious conclusion, for at least 2 reasons. First, if we accept the premise that evidence is inconclusive on the health effects of climate change, the precautionary principle should urge us to try to minimize climate change, rather than ignore it. Second, the example of malaria control is not a relevant one, since the disease is only prevalent in tropical and subtropical regions, by and large home to developing countries, not developed ones. While it’s true that malaria has been successfully eradicated in most of the United States South and Southern Europe, where it was common until the mid 1900s, these are largely temperate regions, not tropical or subtropical ones.

Page 10: In paragraph 1 the authors state: “We are not aware of a good method for assessing the humanitarian value of species that may be at risk.” This seems improbable, since the economic literature on the value of ecosystem services is vast and established (for a review of the topic see for example: <http://foreststofaucets.info/wp-content/uploads/2010/03/The-History-of-Ecosystem-Service-in-Economic-Theory-and-Practice-Journal-Citation.doc.pdf>). There are also several real-world examples of markets that have been established to properly value and protect ecosystem services deriving from water basins, rivers, forests, etc.

In paragraph 3 the authors also state: “While the total expected loss of species may have enormous value, we are not aware of any attempt to quantify it.” They cite the AR4 but fail to acknowledge that the Stern report, for example, does provide estimates for those losses (see e.g. p.57, where the 4° scenario anticipates that “around half of all the world’s nature reserves cannot fulfill objectives”, meaning that it would become impossible to extract any economic value from those reserves).

**5) Economic welfare**

Page 11: Paragraph 1 states: “Prior to taking into account climate change, the GDP per capita of the developing world in 2100 under scenario A2 is $11,000; a 4% hit from climate change drops it to $10,560. In 1990, GDP per capita in the developing world was about $1,000.” And paragraph 2 continues by stating: “the variation across socio-economic scenarios dwarfs climate change in terms of their impact on economic outcomes.” Again, the authors are committing the same fallacy discussed above, i.e. comparing 2100 outcomes with the 1990 ones, and misinterpreting the meaning of the scenario projections. As explained in the commentary to page 1, since all the IPCC scenarios assume a positive economic growth for the period 2000-2100, it is rather obvious that global GDP in 2100 would be higher than in 1990 or 2000, in all the scenarios considered. In addition, such long projections of GDP are excruciatingly dependent on arbitrary parameter choices. What matters is that climate change is already causing harm today and that it will cause even more harm, at an increasing speed, both in the short term future and the long term. In fact, based on recent scenario modeling experience (cf. e.g. McKinsey CC v.3.0), no high economic growth scenario is considered compatible with runaway GHG emissions. In other words, unmitigated GHG emissions and fast economic growth are mutually exclusive. Perhaps even more importantly, we can eliminate or significantly reduce that harm caused by climate change at a cost, which is only a fraction of the expected damage. The Stern report states “if we don’t act, the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP **each year**, now and forever. If a wider range of risks and impacts is taken into account, the estimates of damage could rise to 20% of GDP or more. In contrast, the costs of action – reducing greenhouse gas emissions to avoid the worst impacts of climate change – can be limited to around 1% of global GDP each year.” (p. vi). As an example of how figures that tell a story can be used to make entirely opposite arguments, consider this chart:



*Source: Figure 4.1 in Gary W. Yohe, Richard S.J. Tol, Richard G. Richels, Geoffrey J. Blanford 2009: The Challenge of Global Warming, in Lomborg, B 2009: Global Crises, Global Solutions, 2nd edition, Cambridge University Press.*

Lomborg et al. use this as an illustration of how “global warming is a net benefit now and will likely stay so till about 2070, after which it will turn into a net cost.” What matters here is the sign of the effect, or the slope of the curve, and NOT the absolute number. The chart clearly shows that the impact of global warming on GDP is already downhill today and accelerating. No policymaker would be the proponent of a policy that would decrease GDP with certainty now and forever, at an accelerating rate. Yet this is the argument we’re hearing, in the Goodwill paper and elsewhere.