

Climate Change Reality: 1.5 or 2 degrees Celsius? Life or death for Tuvalu?

Tuesday 15 December 2009, by [van YPERSELE Jean-Pascal](#) (Date first published: 13 December 2009).

Ian Fry, the delegate from Tuvalu (a small island state in the Pacific Ocean), had a voice broken by emotion in the COP15 Plenary room Saturday morning when he pleaded for his country's proposal for a Copenhagen legally-binding agreement limiting temperature rise to 1.5°C above pre-industrial. "The fate of my country lies in your hands", he said. The plenary room was suspended to his words. Every normal human being had to be moved. At least I was. Is climate science providing a basis for this emotion? Should the world accept a 2°C rise, a value which seems gaining ground, or is 1.5°C, now advocated by the Alliance of Small Island States and many developing countries, a better target? Does the IPCC provide useful information on this question?

We all know (at least those who understand the scientific methods) that the burning of massive quantities of fossil fuels has destabilized the carbon cycle, since we are emitting every year approximately 20 billion tons of carbon dioxide in excess of what ecosystems and oceans can absorb. These contribute to thicken the layer of heat-trapping gases around the Earth, and warm its climate. The average warming over the last 100 years is of the order of 0.8°C, and has been called "unequivocal" by IPCC in its last report (www.ipcc.ch). After assessing hundreds of articles, the IPCC concluded that most of the observed increase in global temperatures since 1950 is very likely due to the observed increase in human greenhouse gas concentrations. If emissions continue unabated, global temperatures are likely to rise between 1.6 and 6.9°C above pre-industrial before the end of this century (except noted otherwise, all warming or sea-level increase values given below will be expressed with respect to the pre-industrial values.)

The physics behind this is extremely solid, and those who are not convinced either have not read the IPCC reports in good faith, or are blinded by the short-term interests they defend.

Climate warming over the last three decades has likely already had a discernible influence on many physical and biological systems. It is likely that the summer 2003 European heat wave (70000 additional deaths over the summer) and Hurricane Katrina in 2005 were both intensified to some extent by warming. But these are nothing compared to the impacts in store. In the future, human health, many ecosystems (both terrestrial and marine), water resources, agriculture, and low-lying coastal systems are likely to be especially affected by climate change. This is true also for small islands, where there is high exposure of population and infrastructure to sea level rise.

The UN Framework Climate Convention, adopted in 1992, states in its Article 2 that its ultimate objective is to "... prevent dangerous anthropogenic interference with the climate system." The first policymakers who gave a quantitative interpretation to this article are the European Council of Ministers, who decided, in June 1996 that, in order to avoid this "dangerous interference", we should never allow a global warming that exceeds 2°C above pre-industrial. This was decided 13 years ago, on the basis of the second IPCC Assessment Report.

The Third IPCC Report, published in 2001, contained the "burning embers" diagram synthesising the severity of risk associated with five "reasons for concern" (RFC) in function of the global

temperature increase, using a colour scheme easy to understand: a graduation from white (low risk) to yellow (significant risk) to red (severe risk). In retrospect, it kind of justified the political choice made by the EU leaders in 1996: the transition between the yellow (significant risk) and red (severe risk) zones was located for the first two RFCs around 2°C (about 1.5°C above the 1990 temperature).

The last IPCC report (2007) contained an updated assessment of these RFCs, and an updated diagram was published in 2009 by PNAS (look for Smith et al. on www.pnas.org or on www.climate.be/vanyp). This diagram clearly shows that the red zones are entered in at a lower warming threshold than in the 2001 version for each RFC. The downward movement is by at least 0.5°C. In other words, the 2°C threshold that could be considered somewhat “safe” on the basis of the 2001 report urgently needs a political update. My guess is that if the same European Ministers who decided, thirteen years ago, that the target ought to be 2°C would look at the evidence in the last IPCC report, they would have to conclude that a lower target, probably 1.5°C, is warranted. Please note that when I say this, I am not policy-prescriptive, I only highlight the evolution of knowledge that has taken place over the past 13 years, and suggest that using the same criteria they used in 1996, those Ministers would likely pick a lower target. I hope this is policy relevant.

Another way to look at the same issue, to understand the 1.5 versus 2°C debate, is to check what the IPCC writes about sea level changes for a 2°C warming. For a 2 to 2.4°C warming, the last IPCC report gives a sea-level increase at equilibrium of the order of 0.4 - 1.4 metres above the pre-industrial level for water thermal expansion only, but did not give a total estimate. A total number should take into account, in addition to water expansion, the melting of glaciers and small ice caps, and more important, the melting of the Greenland and Antarctic ice sheets. Glaciers and small ice caps contain the equivalent of 15 to 37 cm of sea-level increase, and have started to melt already.

The Greenland represents 7 metres, and Antarctica 56 metres of sea-level rise. Given that the threshold for the long-term viability of the Greenland ice sheet has been assessed to be between 1.9 and 4.6°C global warming, and noting the uncertainty about the long-term sea level contribution from Antarctica (Oppenheimer and Alley have suggested in 2005 that a sustained global warming of 2.5°C would be a threshold beyond which there would be a commitment to a large sea level contribution from the West Antarctic Ice Sheet, but there is no consensus on this value), one can easily understand why Tuvalu and Small Island States are concerned: 2°C means ultimately at least 40 cm from thermal expansion, plus at (the very) least 10 cm from the melting of glaciers, plus potentially 7 metres from the melting of the Greenland ice sheet, plus some contribution from Antarctica!

Tuvalu's highest point, Ian Fry told the Plenary, is less than 4 metres, with its entire population living at less than 2 metres above sea level.

One can therefore understand why choosing 1.5 or 2°C for the ultimate goal matters for him, and why he was crying Saturday morning, preparing his intervention for the COP Plenary.

There are many other reasons why a 2°C world might not be so safe after all. The last IPCC report also contains these sentences, which I find terrible: “Approximately 20 to 30% of [plant and animal] species assessed so far are likely to be at increased risk of extinction if warming exceeds 2 to 3°C.” Those species don't have a Ian Fry to speak on their behalf, but wouldn't the fate of our human species be better, wherever we live, if these other species, who provide so many ecosystem services, were allowed to survive?

I rediscovered an old book the other day. It is the report written by Barbara Ward and René Dubos in preparation of the 1972 UN Conference on environment, in Stockholm. It contained these

visionary sentences: "The increasing concentration of carbon dioxide in the air means that, at the present rates of use, the earth's temperature could rise by 0.5°C by the year 2000." (Well, this is precisely what happened.) and: "We [need to] wonder whether the sum of all likely fossil fuel demands in the early decades of the [21st] century might not greatly increase the emission of CO₂ into the atmosphere and by doing so bring up average surface temperature uncomfortably close to that rise of 2°C which might set in motion the long-term warming-up of the planet."

So, the science disputed by some today was already so clear 37 years ago!

We should remember the title of that visionary 1972 report (and revisit the numbers it contains, on the basis of the latest science): "Only one Earth".

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P.S.

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