IPCC Special Report on Global Warming Leaves Policymakers Not Much the Wiser

Yamaguchi Mitsutsune analyzes the IPCC's latest special report on global warming.

The Special Report on Global Warming of 1.5°C ("SR1.5") from the IPCC (Intergovernmental Panel on Climate Change) was completed in the fall of 2018 on the request of the 21st Conference of the Parties (COP21) of the Framework Convention on Climate Change (UNFCCC) in Paris in 2015. COP requested the IPCC report on two points specifically: (1) "Impacts of global warming of 1.5°C above pre-industrial levels" and (2) "Emission pathways to reach the goal." SR1.5 faithfully addresses these points.

The report consists of the Summary for Policymakers (SPM) and five chapters that make up its basis. The SPM is divided into four sections from A to D.

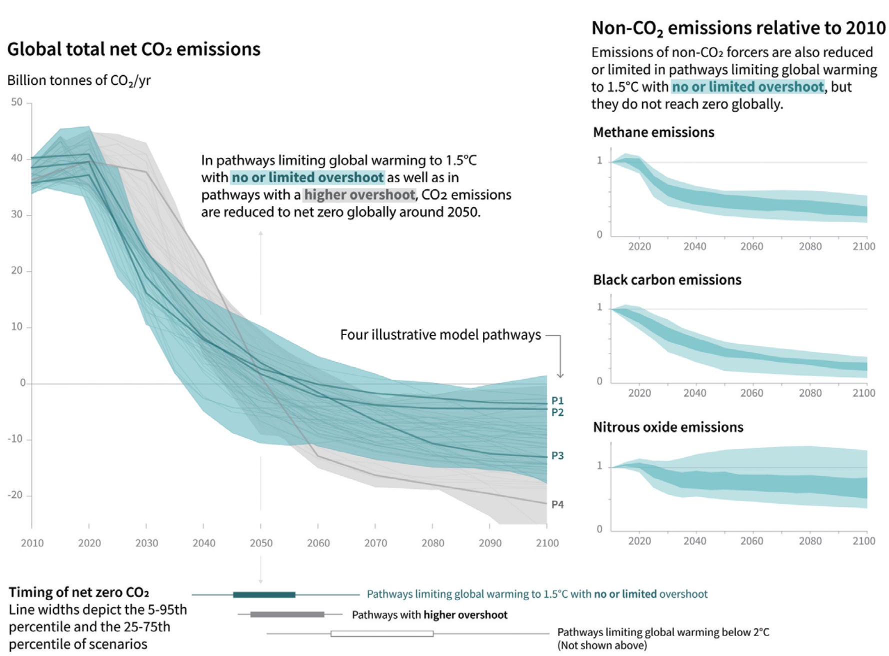
Section A is titled "Understanding Global Warming of 1.5°C" and its contents are mainly climatological. Two important messages here are that the temperature has increased by around 1°C since pre-industrial times due to human activities and that it is predicted to exceed 1.5°C in 2030–2052 with the current rate of increase.

Section B is titled "Projected Climate Change, Potential Impacts and Associated Risks" and its contents are mainly a comparison between a temperature increase by 1.5°C and by 2°C, consistently stating that a 1.5°C increase will have a smaller impact. This is very much in line with common sense. In concrete terms, the sea level will rise by 26–77 cm by the year 2100 with a 1.5°C increase, 10 cm lower than if there had been a 2°C increase. Assuming no adaption, the number of people at risk of a rising sea level would be 10 million fewer than if there were a 2°C increase. 70–90% of existing coral reefs would disappear with a 1.5°C increase, but more than 99% would be lost with a 2°C increase. Section 2 cites a lot of examples like this.

Section C is called "Emission Pathways and Transitions consistent with 1.5°C Global Warming." It states that a scenario consistent with 1.5°C would require a 45% decrease of worldwide net CO_2 emissions compared to 2010 levels by 2030 and net zero emissions around 2050. Considering that global emissions keep increasing, we can easily imagine how difficult the 1.5°C is to reach simply by hearing that we need a 45% reduction in a decade or so. Furthermore, this chapter shows a figure depicting emission pathways for accomplishing 1.5°C, but it is quite radical since it mostly asks that we offset positive emissions through large volumes of negative emissions — most of it through bio-energy, carbon capture and storage (BECCS) — by about 2050, thereby achieving a net zero (**Figure 1**).

Next, this section shows four business-as-usual (BAU) illustrative model pathways, including a massive decrease in energy demand and development centered on fossil fuels. It then

Figure 1: Global emissions pathways consistent with a 1.5°C warmer world



Source: IPCC SR1.5 Figure SPM.3a

shows the differences between pathways if each were to reach the 1.5°C goal and emphasizes in what important ways the structure of society should be changed in parallel with such measures. Another point to stress here is that the remaining carbon budget (total CO_2 emissions allowed if the goal is to be reached) is increasing. Part of the reason for this is that the definition of temperature has changed from the conventional surface air temperature (SAT), which takes into consideration surface temperature without differentiating between sea and land, to global mean surface temperature (GMST), which uses sea surface temperature for the sea.

Section D is titled "Strengthening the Global Response in the Context of Sustainable Development and Efforts to Eradicate Poverty." The most important point in this section is that it asserts that the 1.5°C goal cannot possibly be reached even if all countries fulfill their pledges as promised, and this is a severe message to policymakers. It also states that the feasibility of reaching the 1.5°C goal depends on everything from geophysics, the environment, and ecosystems to technology, economy, society, and culture, but this is not easily conveyed to policymakers on account of being too abstract.

This section illustrates the synergy and trade-off between climate change and the other sixteen SDGs (Sustainable Development Goals) on the basis of a limited range of literature. It then argues that the synergy between climate change measures and the other SDGs surpasses their trade-off overall. However, this ends up being an abstract account since the individual SDGs have not been weighted.

What to Improve

The author would like to mention two important factors: cost and uncertainty. To begin with, cost. There exist two types of cost. "Economic cost," which refers to the cost of the economy as a whole (expressed as GDP or consumption loss), and "marginal abasement cost" (MAC) or "carbon price." These costs are not the same.

There is no mention of economic cost anywhere in the SR1.5. The only reference to be found about economic cost in the SPM is that "the literature — is limited," saying only that it was not assessed in the SR1.5. Reading this report through the eyes of policymakers, it is clear that keeping the temperature rise down at 1.5°C instead of 2°C would reduce damages, but one notices that there is no mention of what additional costs (endeavor) this would require. This makes it impossible for the policymaker to know whether they should choose 1.5°C as a goal. A reading of the main text shows that there are as many as ninety scenarios consistent with 1.5°C assessed in this report. The SPM should have been explicit about how many of these economic costs had been calculated for and what figures they had yielded. For your reference, the SPM of the IPCC Fifth Assessment Report (AR5) shows the economic cost of the 2°C target as well as how much the cost would increase in case of technological and other obstacles. Furthermore, readers should be aware that the costs were calculated using the principle of least cost. This means costs are calculated on the assumption of a global uniform carbon tax. This is quite unrealistic. I would like to point out that the actual cost would be far higher.

Next, the SPM of the SR1.5 merely states that the MAC (carbon price) for reaching the 1.5°C goal would be 4–5 times higher than the MAC for the 2°C target. This really is not meaningful information in the eyes of a policymaker. In fact, Chapter 2 of the main text has numbers, which can be arranged in tabular form (**Table 1**).

Table 1: Carbon price depending on temperature rise (US dollars, t/CO_2)

Goal	2030	2050	2070	2100
2°C High Overshoot	15-220	45-1050	120-1100	175-2340
1.5°C High Overshoot	135-6050	245-14300	420-19300	690-30100

Including numbers like these in the SPM will allow policymakers to judge for themselves.

Uncertainty

The climate change issue comes with great uncertainty in a variety of aspects. The greatest one is climate sensitivity (the extent of increase in temperature when CO_2 concentration doubles). According to the AR5, this is 1.5°C–4.5°C with a probability in the range of 66%, meaning a temperature gap multiplying by three. Thus, in the case of a temperature goal, there is an endless number of concentrations by which it can be reached, and so an endless number of scenarios. The SR1.5 has the same problem as it follows the climate sensitivity in the AR5. The scenarios for reaching a goal change considerably if climate sensitivity changes. The SPM never touches on this massive uncertainty in any way, but it should have been specified.

Besides that, there is also a lot of uncertainty with BAU itself, and it is uncertain to what extent applicable technologies can be acquired and what the cost would be. There is a big question mark on the feasibility of BECCS, a technology hoped to play a central role in reaching the 1.5°C goal. In order for the IPCC reports to become policy relevant, it is absolutely necessary that they clearly show policymakers the uncertainties.

I hope that these issues relating to cost and uncertainty can be tackled head-on in the AR6 (IPCC Sixth Assessment Report) to be published right before the 2023 Global Stocktake.

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