Everything about climate policy seems to be difficult, but one of the big challenges has been choosing goals. Many of the targets to date, including California's AB 32 mandate to return to 1990 greenhouse gas emission levels by 2020, have been based more on what seems feasible than on what seems necessary. NASA's James Hansen argues for a target atmospheric CO2 level of 350 ppm (compared with the current level of about 392 ppm and climbing) "if humanity wishes to preserve a planet similar to that on which civilization developed and to which life on Earth is adapted." The IPCC has proposed a goal of keeping global mean temperature increase to no more than 2 or 3° C.

Now an expert committee appointed by the National Research Council, chaired by NOAA's Susan Solomon, has waded into the question of targets. Rather than argue for a specific goal, the committee has tried to quantify the effects of each 1° C increase in global mean temperature (1° C = 1.8° F), based on a review of published literature. The conclusions are sobering. For every 1° C temperature increase, the committee expects:

- 5-10% changes in precipitation in a number of regions
- 3-10% increases in heavy rainfall
- 5-15% yield reductions of a number of crops
- 5-10% changes in streamflow in many river basins worldwide
- About 15% and 25% decreases in the extent of annually averaged and September Arctic sea ice, respectively

Many other important impacts of climate change are difficult to quantify for a given change in global average temperature, in part because temperature is not the only driver of change for some impacts; multiple environmental and other human factors come into play. It is clear from scientific studies, however, that a number of projected impacts scale approximately with temperature. Examples include shifts in the range and abundance of some terrestrial and marine species, increased risk of heat-related human health impacts, and loss of infrastructure in the coastal regions and the Arctic.

The committee also notes that because CO2 is long-lived in the atmosphere, deep emission cuts will be needed to stabilize atmospheric CO2. And it points out the substantial uncertainty about just how much temperature rise will result from any given atmospheric

CO2 level. The committee's best estimate is that CO2 concentrations would have to be stabilized at about 430 ppm to limit global temperature increases to 2° C (which would mean about 10-20% changes in precipitation, 10-30% reductions in crop yields, etc.). But even 370 ppm, which is below current levels, could bring those effects, or we might get away with no worse even if CO2 levels get as high as 540 ppm.

Because of those uncertainties, I don't expect this new report to move the policy debate. It does point out how bad things *could* get, and how much difference the choice of targets makes. But there is still so much uncertainty that even people who agree on what level of impacts is acceptable can disagree about the level of emission reductions needed to achieve that goal. And of course this kind of analysis can't solve what seems to be the most vexing policy question at the international level, which is how any agreed-upon level of emission reductions should be distributed.