Global climate diagnosis worsening

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The 2007 UN Intergovernmental Panel on Climate Change (IPCC) report, which forms the scientific basis for the discussions at the Copenhagen summit, concluded that the world's advanced economies had to cut their carbon emissions by between 25 and 40 percent by 2020, compared to 1990, and be followed by further dramatic reductions in order to prevent global temperatures rising by more than 2 degrees Centigrade above pre-industrial levels.

With the next major IPCC analysis not due until 2013, an international group of 26 climate change scientists, including many lead IPCC authors, published an update last month. Entitled, "The Copenhagen Diagnosis," it is based on the substantial body of scientific research published over the past three years. It concludes that the latest findings not only confirm the trends reported in 2007, but in a number of key areas exceed previous expectations.

Among their main conclusions are:

1. Greenhouse gas emissions are surging rather than diminishing. The combined global emissions of carbon dioxide (CO2) in 2008 from fossil fuel burning, cement production and land use change (mainly deforestation) were 27 percent higher than in 1990. Global carbon dioxide emissions from fossil fuels in 2008 were nearly 40 percent higher than those in 1990. The annual rate of increase has accelerated from 1 percent in the 1990s to 3.4 percent between 2000 and 2008.

Moreover, new studies show that the ability of the oceans and terrestrial carbon sinks, such as forests, to absorb CO2 is diminishing. The report concludes: "Our current understanding indicates that the natural CO2 sinks will decrease in efficiency during this century, and the terrestrial sink could even start to emit CO2. The response of the sinks to elevated CO2 and climate change is shown in models to amplify global warming by 5-30 percent."

The research since 2007 has demonstrated that global warming will lead to an atmosphere containing more water vapour, which in turn will enhance the greenhouse effect. The reported notes: "This is a common theme from recent science: uncertainties existing in AR4 [the 2007 report], once resolved, point to a more rapidly changing and more sensitive climate than we previously thought."

2. The latest data confirms that the trend in global warming is continuing. Over the past 25 years, temperatures have increased at the rate of 0.187 degree Centigrade per decade for the period ending 2008. The report explains that short-term variations can take place as a result of the regular changes in the intensity of solar radiation and change climate patterns, but do not affect the long-term trend. Every year this century, 2001-2008, has been among the top warmest years since instrumental records began in the mid-nineteenth century. Low solar radiance combined with a La Niña climate effect should have made global temperatures in 2008 among the lowest on record. Instead, 2008 was the ninth highest.

3. The melting of ice-sheets, glaciers and ice-caps provides clear evidence of global warming. The report explains: "A wide array of satellite and ice measurements now demonstrate beyond doubt that both the Greenland and Antarctic ice-sheets are losing mass at an increasing rate. Melting glaciers and ice-caps in other parts of the world has also accelerated since 1990." One of the most dramatic observations was that the summer-time melting of Arctic sea-ice in the period 2007-2009 was about 40 percent greater than predicted

in the 2007 IPCC report, making the prospect of an ice-free Arctic Ocean during summer “very likely” in the coming decades.

While the melting of sea-ice does not raise overall sea levels, the report pointed out that the collapse of ice-shelves renders ice-sheets and glaciers vulnerable to more rapid melting. Satellite measurements show that the sea-level has risen by 3.4 millimetres per year since these records began in 1993. Based on the latest understanding of ice-sheet melting, the report concludes that sea-level rise until 2100 is likely to be at least twice the level predicted by the IPCC in 2007, with an upper limit of about 2 metres. Currently 160 million people live less than 1 metre above sea level.

4. The report identifies a number of key tipping points—abrupt changes in climatic conditions caused by human activity—most of which will have major negative impacts on human populations. These include the potential for the terrestrial ice sheets, particularly Greenland, to commit to shrinking, which once underway will have low reversibility and lead to large rises in sea levels. Other possible tipping points include major disruptions of the West African and Indian monsoonal patterns that would dramatically increase droughts in these regions, and the danger that die-back in the Amazon rainforest could lead to its replacement by savannah forest. The report warns against delays, stating that “the risk of transgressing critical thresholds increases strongly with ongoing climate change”.

5. The report observes: “While global warming can be stopped, it cannot easily be reversed due to the long lifetime of carbon dioxide in the atmosphere. Even a thousand years after reaching a zero-emission society, temperatures will remain elevated, likely cooling down by one a few tenths of a degree below their peak values. Therefore, decisions taken now have profound and practically irreversible consequences for many generations to come, unless affordable ways to extract CO2 from the atmosphere in massive amounts can be found in the future. The chances of this do not appear to be promising.”

The authors note that even if global emission rates were stabilised at present day levels, just 20 more years of emissions would give a 25 percent probability that warming exceeds 2 degrees Centigrade even with zero emissions after 2030. “The turning point must come soon. If global warming is to be limited to a maximum of 2 degrees Centigrade above pre-industrial values, global emissions need to peak between 2015 and 2020 and then decline rapidly. To stabilise climate, a decarbonised global society—with near-zero emissions of CO2 and other long-lived greenhouse gases—needs to be reached well within this century,” they conclude.

It is highly unlikely such targets will be agreed to at the Copenhagen summit, let alone actually achieved.