FUTURE AT RISK ON A HOTTER PLANET[1]

Lester R. Brown©

We are entering a new era, one of rapid and often unpredictable climate change. In fact, the new climate norm is change. The 25 warmest years on record have come since 1980. And the 10 warmest years since global recordkeeping began in 1880 have come since 1998. The effects of rising temperature are pervasive. Higher temperatures diminish crop yields, melt the mountain glaciers that feed rivers, generate more-destructive storms, increase the severity of flooding, intensify drought, cause more-frequent and destructive wildfires, and alter ecosystems everywhere. We are altering the earth's climate, setting in motion trends we do not always understand with consequences we cannot anticipate. Crop-withering heat waves have lowered grain harvests in key food-producing regions in recent years. One with a profoundly direct human impact was the searing heat wave that broke temperature records across Europe in 2003. The intense heat, which contributed to the world grain harvest falling short of consumption by 90 million tons, also claimed more than 52,000 lives.

There has also been a dramatic increase in the land area affected by drought in recent decades. A team of scientists at the National Center for Atmospheric Research reports that the area of the globe experiencing very dry conditions expanded from less than 15 percent in the 1970s to roughly 30 percent by 2002. The scientists attribute part of the change to a rise in temperature and part to reduced precipitation, with high temperatures becoming progressively more important during the latter part of the period. A 2009 report published by the U.S. National Academy of Sciences reinforces these findings. It concludes that if atmospheric CO_2 climbs to 450-600 ppm, the world will face irreversible dry-season rainfall reductions in several regions of the world. The study likened the conditions to those of the U.S. Dust Bowl era of the 1930s.

The warming is caused by the accumulation of heat-trapping "greenhouse" gases and other pollutants in the atmosphere. Of the greenhouse gases, CO_2 accounts for 63 percent of the recent warming trend, methane 18 percent, and nitrous oxide 6 percent, with several lesser gases accounting for the remaining 13 percent. Carbon dioxide comes mostly from electricity generation, heating, transportation, and industry. In contrast, human-caused methane and nitrous oxide emissions come largely from agriculture—methane from rice paddies and cattle and nitrous oxide from the use of nitrogenous fertilizer.

Atmospheric concentrations of CO_2, the principal driver of climate change, have climbed from nearly 280 parts per million (ppm) when the Industrial Revolution began around 1760 to 387 ppm in 2009. The annual rise in atmospheric CO_2 level, now one of the world's most predictable environmental trends, results from emissions on a scale that is overwhelming nature's capacity to absorb carbon. In 2008, some 7.9 billion tons of carbon were emitted from the burning of fossil fuels and 1.5 billion tons were emitted from deforestation, for a total of 9.4 billion tons. But since nature has been absorbing only about 5 billion tons per year in oceans, soils, and vegetation, nearly half of those emissions stay in the atmosphere, pushing up CO_2 levels.

Methane, a potent greenhouse gas, is produced when organic matter is broken down under anaerobic conditions, including the decomposition of plant material in bogs, organic materials in landfills, or forage in a cow's stomach. Methane can also be released with the thawing of

[1] Earth Policy Release, Plan B 4.0 Book Byte, Earth Policy Institute, December 01, 2010

permafrost, the frozen ground underlying the tundra that covers nearly 9 million square miles in the northern latitudes. All together, Arctic soils contain more carbon than currently resides in the atmosphere, which is a worry considering that permafrost is now melting in Alaska, northern Canada, and Siberia, creating lakes and releasing methane. Once they get under way, permafrost melting, the release of methane and CO2, and rising temperature create a self-reinforcing trend, what scientists call a "positive feedback loop." The risk is that the release of a massive amount of methane into the atmosphere from melting permafrost could simply overwhelm efforts to stabilize climate.

Another unsettling development is the effect of atmospheric brown clouds (ABCs) consisting of soot particles from burning coal, diesel fuel, or wood. These particles affect climate in three ways. First, by intercepting sunlight, they heat the upper atmosphere. Second, because they also reflect sunlight, they have a dimming effect, lowering the earth's surface temperature. And third, if particles from these brown clouds are deposited on snow and ice, they darken the surface and accelerate melting. These effects are of particular concern in India and China, where a large ABC over the Tibetan Plateau is contributing to the melting of glaciers that supply the major rivers of Asia. Soot deposition causes earlier seasonal melting of mountain snow in ranges as different as the Himalayas of Asia and the Sierra Nevada of California, and it is also believed to be accelerating the melting of Arctic sea ice. In contrast to CO2, which may remain in the atmosphere for a century or more, soot particles in ABCs are typically airborne for only a matter of weeks. Thus, once coal-fired power plants are closed or wood cooking stoves are replaced with solar cookers, atmospheric soot disappears rapidly.

If we continue with business as usual, the Intergovernmental Panel on Climate Change's (IPCC's) projected rise in the earth's average temperature of 1.1-6.4 degrees Celsius (2-11 degrees Fahrenheit) during this century seems all too possible. Unfortunately, during the several years since the IPCC study was released, both global CO2 emissions and atmospheric CO2 concentrations have exceeded those in its worst-case scenario. With each passing year the chorus of urgency from the scientific community intensifies. Each new report indicates that we are running out of time. For instance, a landmark 2009 study by a team of scientists from the Massachusetts Institute of Technology concluded that the effects of climate change will be twice as severe as those they projected as recently as six years prior. Instead of a likely global temperature rise of 2.4 degrees Celsius, they now see a rise exceeding 5 degrees.

Another report, this one prepared independently as a background document for the December 2009 international climate negotiations in Copenhagen, indicated that every effort should be made to hold the temperature rise to 2 degrees Celsius above pre-industrial levels. Beyond this, dangerous climate change is considered inevitable. To hold the temperature rise to 2 degrees, the scientists note that CO2 emissions should be reduced by 60-80 percent immediately, but since this is not possible, they note that, "To limit the extent of the overshoot, emissions should peak in the near future."

The Pew Center on Global Climate Change sponsored an analysis of some 40 scientific studies that link rising temperature with changes in ecosystems. Among the many changes reported are: spring arriving nearly two weeks earlier in the United States, tree swallows nesting nine days earlier than they did 40 years ago, and a northward shift of red fox habitat that has it encroaching on the Arctic fox's range. The Inuit have been surprised by the appearance of robins, a bird they have never seen before. Indeed, there is no word in Inuit for "robin."

Douglas Inkley, National Wildlife Federation senior science advisor, notes, "We face the prospect that the world of wildlife that we now know—and many of the places we have invested decades of work in conserving as refuges and habitats for wildlife—will cease to exist as we know them, unless we change this forecast." Unfortunately, this observation holds true for humans as well. If we cannot quickly reduce carbon emissions, it is civilization itself that is at risk.