

## Six Interactive Global Crises



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**Abstract :** Humankind is facing six interactive global crises: (1) climate change, (2) overpopulation, (3) species impoverishment (*i.e.*, loss of biodiversity), (4) ecological overshoot (*i.e.*, ecological deficit), (5) excessive use of fossil fuels (*i.e.*, which release carbon dioxide when burned), (6) inadequate food and water. Since, the crises are interactive, they must be resolved simultaneously; furthermore, since they are all global, only a global solution by all nations will suffice. Since these crises are probably all at or near a major tipping point, major action must be immediate. Failure to resolve any of the issues almost certainly means the end of civilization as it currently exists. The present population numbers, density, and distribution mean that failure to resolve even one of the six crises could have catastrophic consequences. The obstacles to reaching these goals are formidable since anthropogenic greenhouse gas emissions are still increasing dramatically, exponential population growth continues, biodiversity loss is at an unacceptable level, ecological overshoot day occurs earlier each year, the global financial recession has reduced fossil fuel consumption but economically retrievable reserves are diminishing, and climate change is having adverse effects upon both agricultural productivity and supplies of freshwater. Ironically, rapid economic growth has caused, directly or indirectly, all of these problems, as has exponential human population growth and resource consumption. Since global climate change is irreversible, the climate changes occurring after each tipping point will persist. Each of these major changes will affect the biosphere, of which humankind is a part. Failure to adapt to these changes will mean extinction for many species and could include *Homo sapiens*. However, if the five great past extinctions are a reliable guide, then life will survive and, over evolutionary time, biodiversity will be restored. The present biosphere is worth preserving since it has maintained conditions favorable to hominids for 4 million years and since it is the source of resources upon which the human economy depends.

**Key words :** Climate change, Overpopulation, Biodiversity loss, Ecological overshoot, Fossil fuels, Food and water supplies.

*The test of our progress is not whether we add more to the abundance of those who have much, it is whether we provide enough for those who have little.*

**Franklin D. Roosevelt**  
**Former US President**

*But while they prate of economic laws, men and women are starving. We must lay hold of the fact that economic laws are not made by nature. They are made by human beings.*

**Franklin D. Roosevelt**  
**Former US President**

*The point in history at which we stand is full of promise and danger. The world will either move forward toward unity and widely shared prosperity – or it will move apart.*

**Franklin D. Roosevelt**  
**Former US President**

Most humans in developed countries are either unaware of or only marginally concerned about the six

interactive global crises that humankind is facing: (1) climate change (*e.g.*, Turney, 2008; Lynas, 2008), (2) overpopulation (Ehrlich and Ehrlich, 1990), (3) species impoverishment (*i.e.*, loss of biodiversity; Perrings *et al.*, 1995), (4) ecological overshoot (*i.e.*, ecological deficit; Wackernagel, 2002), (5) excessive use of fossil fuels (*i.e.*, which release carbon dioxide when burned; Heinberg, 2005) (6) inadequate food and water (Pearce, 2008). Of course, people in third world countries who are experiencing the effects of climate change are suffering noticeably, and they are without resources to do more than survive. When individuals are asked about the changes that have already occurred, the most common reaction is “I don’t want to hear about that!” The second most common response is “No really bad crises will occur in my lifetime.” In short, the end of the comfortable, cornucopian world is unthinkable to most people, who also believe that the planet will never run out of oil. During the last US presidential election, many US citizens were convinced that more offshore drilling would lower gasoline prices, although economically retrievable oil is hard to find.

## Climate Change

The basic problem underlying climate change is simply stated – more greenhouse gases (especially carbon dioxide) are being discharged into the atmosphere than the biosphere can assimilate. Until emissions are reduced to match Earth's assimilative capacity for them, global climate change will continue. If "business as usual" continues, the average global temperature could rise by 4°C by 2060 (Shukman, 2009).

*Two degrees C is already gone as a target. . . Four degrees is definitely possible . . . This is the biggest challenge in our history. . . A four-degree C overall increase means a world where temperatures will be two degrees warmer in some places, 12 degrees and more in others, making them uninhabitable. . . Four degrees of warming would be hotter than any time in the last 30 million years, and it could happen as soon as 2060 or 2070 (Chris West, University of Oxford's UK Climate Impacts Programme, as quoted in Leahy, 2009).*

John Schellnhuber, Director of the Potsdam Institute for Climate Impact Research, "recently briefed U.S. officials from the Barack Obama administration, but he says they chided him that his findings were 'not grounded in political reality' and that 'the [U.S.] Senate will never agree to this'" (as quoted in Leahy, 2009). Which will triumph – political reality or scientific reality?

## Food Shortage Tipping Points

Deleterious effects of climate change on agricultural productivity have occurred over the globe, although the severity varies from one region to another.

*A World Bank study of India's water balance notes that 15 percent of its grain harvest is produced by overpumping [aquifers]. In human terms, 175 million Indians are being fed with grain produced from wells that will be going dry. The comparable number for China is 130 million. Among the many other countries facing harvest reductions from groundwater depletion are Pakistan, Iran, and Yemen . . . The number of hungry people, which was declining for several decades, bottomed out in the mid-1990s at 825 million. It then climbed to 915 million in 2008 and jumped to 1 billion in 2009. With world food prices projected to continue rising, so too will the number of hungry people, leaving millions of families trying to survive on one meal per day (News Release, 2009).*

Agricultural productivity is diminished by many other factors as well, such as changes in rainfall patterns, hazardous chemicals, sea level rise, pests, and so on. The important point is that all reductions in agricultural productivity decrease Earth's carrying capacity for humans. This situation is not sustainable during a period of exponential population growth.

Decreased supplies of freshwater will affect both agricultural productivity and Earth's carrying capacity for humans. Adding 215,000 additional people to Earth's human population daily will put additional demand on declining food and water supplies, as well as on all societal systems (e.g., education, health care, housing, energy, police forces). Taxes to support these services will have to be raised or the services will have to be curtailed. A pandemic disease would overwhelm societal services, especially health care. This high risk scenario will be worsened if the global average temperature increases by 4°C as predicted by the UK Met Office (James, 2009). Although not mentioned in this report, a 4°C rise would almost certainly accelerate the release of sequestered carbon and increase the effects of the positive feedback loops. These two examples are illustrative of the interactions in complex, interactive, multivariate systems such as climate.

## Past Behavior Predicts Future Behavior

Unless a major paradigm shift occurs, past behavior is a good predictor of future behavior. In the United States, recent polls indicate that as many as 40-50% of the citizens are skeptical about the reality of global warming. This situation is not favorable to rapid reduction of anthropogenic greenhouse gas emissions. Some outspoken critics of climate change science hold seats in the US Congress (e.g., Senator James Inhof and Congressman Joe Barton). If the present behaviors continue, humankind will face a world described superbly by Rubin (2009): "Suddenly the text books seem to be describing some other world than the one we live in." Perhaps the December 2009 Climate Change Conference in Copenhagen will accomplish a miracle and all participating nations will agree to immediate, major reductions in anthropogenic greenhouse gas emissions. However, no agreement is reached, the transition to a new biosphere will continue, and, in evolutionary time, a new biosphere will exist that has a mostly different array of species in which *Homo sapiens* may or may not have a role. Smith et al. (2009) state: "The severity of damaging human-induced climate change depends not only on the magnitude of the change but also on the potential for irreversibility, the climate change that takes

place due to increases in carbon dioxide concentration is largely irreversible for 1,000 years after emissions stop.” Anyone familiar with risk analysis would consider that situation alone justification for immediate drastic reductions in greenhouse gas emissions. Humankind is literally creating an alien planet and does not seem particularly concerned about it.

## Conclusions

Welcome to a world of change – how rapidly and how much change depends on a number of known factors and probably some surprises! One major obstacle to remedial action in the United States (and very likely elsewhere in the world) is the very large number of people still skeptical about any human influence on global climate change. Another major obstacle is the well financed disinformation campaign –for example,

*. . .the idea things are cooling has been repeated in opinion columns, a BBC news story posted on the Drudge Report and in a new book by the authors of the best-seller Freakonomics. Last week, a poll by the Pew Research Center found that only 57 percent of Americans now believe there is strong scientific evidence for global warming, down from 77 percent in 2006 . . . Ben Santer, a climate scientist at the Department of Energy’s Lawrence Livermore National Lab, called it ‘a concerted strategy to obfuscate and generate confusion in the minds of the public and policy-makers’ ahead of the international climate talks in December 2009 in Copenhagen (Borenstein, 2009).*

The preponderance of scientific evidence that the global average temperature is increasing and that anthropogenic greenhouse gas emissions are a significant factor appears to have less effect in 2009 than in 2006. Is this denial or an inability to understand interactive system level effects or both?

McCarthy (2009) reports: “A vital safeguard to protect the world’s rainforests from being cut down has been dropped from a global deforestation treaty due to be signed at the climate summit in Copenhagen in December [2009].”

These examples are just a few of the threats to the biospheric life support system. The prospects for saving the biosphere and civilization do not appear promising. However, scientists must keep doing research and publishing on this very critical problem of global climate

change. In addition, citizens and their political representatives must keep firmly in mind that these interactive, global crises cannot be addressed individually. All are subsystems within the ultimate Earth system – the biosphere. The human economy is dependent upon the biosphere and should not be treated as if it were more important than the biosphere. Finally, humankind must acknowledge that it is part of the present biosphere upon which its survival depends.

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