

## Adapting to the New Biosphere\*

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*Business as usual is dead – green growth is the answer to both our climate and economic problems.*

Anders Fogh Rasmussen  
Danish Prime Minister

Speculation about the future is essential in this era of rapid environmental change lest human society gets caught by unexpected events. Species are being lost at a rate unprecedented in human history. Rainfall patterns are changing, and habitats, such as forests, are still being lost. All too frequently, surprising shocks occur, such as the unexpected decomposition of plastics in the oceans and the probable release of toxics.

### Surviving Species

The surviving species of the present great extinction will be dominated by ones least affected by human activities and technologies. If "business as usual" continues, the further loss of species can be expected. From those remaining, a new array of species will evolve, if the past five great extinctions are a reliable guide. If politicians are unable to adopt legislation to reduce anthropogenic greenhouse gas emissions sufficiently to arrest climate change, the temptation will emerge for using "Hail Mary" climate engineering technologies to manage Earth's climate. These technologies may or may not do what they are designed to do and may also do things they are not designed to do. Another adaptive challenge for humankind for the new biosphere will be those organisms highly resistant to human control. Perhaps the lesson from this experience will be that humans have less control over nature than they once thought.

### Energy Resources

The discovery of petroleum gave humans more individual power than any other species has ever had. However, now the era of cheap, abundant energy is ending. At one time, petroleum was near Earth's surface and easily acquired with a minimum of effort. At present, drilling for small pockets of oil that are miles below Earth's surface is not uncommon. Petroleum is very useful to agribusiness, which generally involves huge tracts of land. The price of oil is, at present, a major factor in the price of food and is likely to continue to be so for decades to come.

A major unknown is how well domesticated species will respond to climate change. Already climate change has affected wheat and meat production in places as widely separated as Australia and Argentina. Grapes previously grown in a Mediterranean climate are now being grown in southern England because of climate change. If global mean temperature continues to increase, the agricultural system can be moved ever closer to the poles if temperature is the only limiting factor. Rainfall patterns are also critically important – rain must fall when the crops need it. Quantity of water is also important – 1,000 tons of water is need to produce a ton of grain.

"A study, recently published online in Proceedings of the National Academy of Sciences, looked at three frequently used scenarios for global warming. It found the average U.S. yields for corn, soybeans and cotton could plummet 30 percent to 46 percent by the end of the century under the slowest warming scenario, and 63 percent to 82 percent under the quickest" (Price 2009). "David Walter Wolfe, a Cornell University expert on the effects of climate change on crops . . ." has stated: "They're no longer farming in a static environment . . . They can't rely on the calendar to tell them when to plant, they can't rely on the variety of seeds they have always used, and they can't rely on dealing with the same insect pests, because it's all a moving target now" (Price

2009). Humans might adapt to a slow warming scenario, but only if it ceased after a few decades. Adapting to changing conditions will never be easy. Failure to adapt could be fatal.

### **Rate of Climate Change**

McGrath (2009) notes: “The worst-case scenarios on climate change envisioned by the UN two years ago are already being realised, say scientists at an international meeting. . . . More than 2,500 researchers and economists attended this meeting designed to update the world on the state of climate research ahead of key political negotiations set for December this year [in Copenhagen, Denmark].” Although most of the tools needed to reduce anthropogenic carbon dioxide emissions are available, they are not being widely used and probably will not be until politicians take global climate change seriously. Some political leaders are acting on scientific evidence – for example, “Japan’s next leader [Yukio Hatoyama] has promised a big cut in greenhouse gas emissions, saying he will aim for a 25% reduction by 2020 compared with 1990 levels” (Black 2009).

### **Conclusions**

Two volumes – Mark Lynas’ *Six Degrees: Our Future on a Hotter Planet* (2008) and Chris Turney’s *Ice, Mud, and Blood* (2008) – are useful reading on the problems of adapting to a hotter planet. Lynas used the Intergovernmental Panel on Climate Change reports as a basis for the global mean temperature (in °C) increases and devotes a section of the book to each °C increase. A 2°C increase is not something to look forward to; above 2°C is the stuff that causes bad dreams. Turney spends quite a few pages in his book discussing the Paleocene–Eocene Thermal Maximum (PETM). This warming occurred about 55 million years ago and provides fascinating information on what Earth might be like if the global mean temperature increase is hovering about 3°C. Human society has not faced up to the hard facts that thousands of credentialed scientists have provided, and now is the time to act!

### **LITERATURE CITED**

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