

The Tyranny¹ of Tipping Points²

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¹I hesitate to use the term *tyranny* because of its political overtones. My colleague Joyce Akerman suggested using the term *force majeure* or *overwhelming force* as an alternative. I decided to mention this alternative since politicians the world over ignore natural law or minimize its impact. The *force majeure* of natural law can, and has, destroyed societies and their economics many times. Mother Nature does not negotiate or bargain. Violation of natural law carries severe penalties for which no court of appeals exists.

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Complex, multivariate systems (both ecological and societal) have one or more tipping points (breaking points) beyond which the state of the system changes. Often in ecological systems, no warning is given until the system changes. These changes are essentially irreversible in time frames of interest to humans. Tipping points may be global (e.g., pH of oceans) or regional (e.g., droughts in Australia, Argentina, and Kenya). Mother Nature (or natural law) has absolute power – in short, negotiations are not possible.

Even if a region has not passed a tipping point, the lives in that area may still be affected. For example, Australia and Argentina previously exported grain (wheat) and meat, but now they do not; this situation affects prices. If the new, post-tipping point conditions are particularly bad, environmental refugees are almost certainly an outcome, and they could end up on anyone's doorstep. Even if they do not, social systems will be disrupted elsewhere, and that result will affect everyone.

A major climate conference is scheduled for December 2009 in Copenhagen, Denmark. Sovereign nations will proclaim what they will or will not do on such issues as anthropogenic greenhouse gas emissions. However, they cannot negotiate with Mother Nature. If natural laws have been violated, severe consequences will ensue, even if the delegates have agreed to substantial reductions in anthropogenic greenhouse gas emissions by 2050.

If anthropogenic carbon dioxide emissions are kept within Earth's assimilative capacity for them, the concentration in the atmosphere should not increase unless positive feedback loops become worse. Much carbon is stored in frozen permafrost, wetlands, and frozen hydrated methane on the ocean floor. Global heating will cause release of methane and carbon dioxide, thus creating a positive feedback loop. Positive feedback loops can accelerate the process of global climate change and, at worst, can negate all the negotiations between sovereign nations. Once a tipping point has been passed and the situation is irreversible, adjustment to the new circumstances is the best and, in fact, the only course of action.

The concept of tipping points is covered in the scientific literature, although the term *irreversible damage* is often used to denote the same idea.