

CHAPTER 24

The Ultimate Feedback Loop and the Inevitable Ultimate Tipping Point

Congress should be forward thinking in the policies we set, instead of waiting until catastrophe looms.

Bill Frist
Former US Senator

History is a race between education and catastrophe.

H. G. Wells

Life improves slowly and goes wrong fast, and only catastrophe is clearly visible.

Edward Teller

Understanding the laws of nature does not mean we are immune to their operations.

David Gerrold

Questioning what we believe and want is difficult at the best of times, and especially difficult when we most need to do it, but we can benefit from the informed opinion of others.

Daniel Kahneman (2011, p. 1)

The Genesis of a Major Global Catastrophe

Humanity knows

- (1) that atmospheric greenhouse gases cause global warming,
- (2) that amounts of atmospheric greenhouse gases in excess of biospheric assimilative capacity accumulate in the atmosphere,
- (3) that burning fossil fuels releases carbon dioxide — a major greenhouse gas,
- (4) that a huge amount of carbon is stored in permafrost and frozen hydrated methane on the floor of oceans, and
- (5) that global warming has melted glaciers and would also thaw the stored carbon, releasing it to the atmosphere; the feedback loop would probably cause runaway climate change.

However, economic growth has been given a high priority over dealing with climate change despite all this knowledge. In addition, economic growth requires vast amounts of energy, which is, at present, generated by combustion of fossil fuels, especially coal. The result of giving climate change a low priority and continuing to use fossil fuels is major environmental changes. “Global warming has brought a ‘new normal’ in the Arctic, with warmer air and ocean temperatures, thinner and less expansive summer sea ice, and greener vegetation in coastal regions abutting the open water” (Spotts 2011). This situation does not bode well for keeping permafrost frozen — thawing will release vast amounts of stored carbon (Schuur and Abbott 2011). “The latest estimate is that some 18.8 million square kilometers of northern soils hold about 17,000 billion tonnes of organic carbon — the remains of plants and animals that have been accumulating in the soil over thousands of years. That is about four times more than all the carbon emitted by human activity in modern times and twice as much as in present in the atmosphere now” (Schuur and Abbott 2011). These estimates are the classic positive feedback loop — the release will speed up global warming which, in turn, will thaw more frozen carbon and increase both the rate and magnitude of warming. “It’s [the Arctic] melting at near record pace, and it’s darkening and absorbing too much of the sun’s heat. A new report card from the National Oceanic and Atmospheric Administration rates the polar region with blazing red stop lights on three of five categories and yellow cautions for the other two. Overall, these are not good grades, but it doesn’t mean the Arctic is doomed and it still will freeze in the winter . . .” (Borenstein 2011).

The positive feedback loop will almost certainly begin working again the next summer since no substantive action on reducing carbon emission has emerged. “The consumer nations of the world possess an enormous amount of leverage over developing countries (and the U.S.) to influence carbon emission reductions. If they began to

collectively impose tariffs on imports from nations that do not place a price on carbon, those exporting nations will face a choice: Either they can watch the consumer nations collect tariff revenue from incoming goods, or they can adopt policies to collect such revenues themselves” (Belleville 2011). Such an action would be a meaningful way to reduce anthropogenic emissions since the scientific evidence clearly demands it.

The Psychology of Protection

The way one sees things changes (Aldag 2011). In addition, people psychologically alter information so that it is more palatable. “Selective perception is our bias toward ignoring information that is at odds with our worldview. Subjective perception explains our tendency to couple uncomfortable information with reaffirming facts in order to make ourselves feel better” (Aldag 2011). Such cognitive tricks do not lead to objective analysis at the regional level, and, at national and global levels on subjects such as global warming, such tricks could be suicidal. Politicians and policymakers routinely refuse to discuss climate change or answer questions about their position on it (Davenport 2011). Congressional representatives in the United States who represent coal-mining states are unlikely to support any policy to curb climate change (Davenport 2011). Some lawmakers acknowledge the “need to address the crisis that climate science says is coming while somehow saving jobs that could be lost in the fossil-fuel industry. . . . plenty of them [politicians] clam up when asked about controversial proposals such as cap-and-trade and pollution regulations” (Davenport 2011).

Some global tipping points have already been activated (e.g., glaciers melting), and others wait in probably the not too distant future. Humanity is clearly not prepared to discuss climate change, let alone take precautionary measures (e.g., regulating greenhouse gas emissions), until more can be learned about the tipping points that produce irreversible global change.

The Blame Game

Politicians in the United States have blocked regulatory measures that would have reduced anthropogenic greenhouse gas emissions, yet they criticize the US Army Corps of Engineers for an inadequate response to floods that almost certainly are related to global climate change (<http://www.msnbc.msn.com/id/45501855>). Floods are one of the symptoms of climate change, which is caused primarily by more greenhouse gas emissions than the Biosphere can assimilate and so they accumulate in the atmosphere.

Research is beginning the United States on injecting carbon dioxide for storage into the Mt. Simon sandstone more than a mile beneath the Illinois surface at Decatur (<http://www.isgs.illinois.edu/research/sequestration/seq-11-17-2011.shtml>). Alternative non-carbon energy sources are the wave of the future, but humanity is still clinging to fossil fuel despite the serious risk of activating the positive global warming feedback loop.

“Social scientists in the 1970s broadly accepted two ideas about human nature. First, people are generally rational, and their thinking is normally sound. Second, emotions such as fear, affection, and hatred explain most of the occasions on which people depart from rationality. . . . both assumptions [can be challenged] . . . systematic errors in the thinking of normal people [can be] traced . . . to the design of the machinery of cognition rather than to the corruption by emotion. . . . People tend to assess the relative importance of issues by the ease with which they are retrieved from memory — and this is largely determined by the extent of coverage in the media. Frequently mentioned topics populate the mind even as others slip away from awareness. In turn, what the media chooses to report corresponds to their view of what is currently on the public’s mind” (Kahneman 2011, p. 8). An example of such thinking is the debate on tobacco smoking. Even with a mass of scientific evidence, the defining moment in the debate was provided by the US Surgeon General’s 1964 report, which officially focused on the link between smoking and cancer. Arguably, the opposition to the report was the genesis of the strong, well-financed anti-science movement in the United States.

The Anti-Science War

A handful of scientists have obscured the truth amassed from scientific evidence on issues from tobacco smoke to global warming (Oreskes and Conway 2011). The disinformation campaign against science tries, very successfully, to create the impression that an ongoing debate exists among scientists about the reality of global warming and that anthropogenic greenhouse gas emissions are a major factor. The news media reinforce this impression with the “balanced view” approach (i.e., statements from both sides) when the preponderance of scientific evidence is on one side and little or no peer-reviewed, scientific evidence exists on the other side. Such “balanced reporting” is clearly impractical in this case, but the news media is using this approach for all reporting on global warming and the other consequences of climate change.

Silence Can Be Deadly

“If there is to be any hope of avoiding civilization-threatening climate disruption, the U.S. and other nations must act immediately and aggressively on an unprecedented scale. . . . The consensus in American politics today is

that there's nothing to be gained from talking about climate change. It's divisive, the electorate has more pressing concerns, and very little can be accomplished anyway" (Roberts 2011). Climate change and the destruction of the present Biosphere are not spectator sports. "The whole climate-change negotiation process is a drawn-out and horrible exercise in lying — to each other, to ourselves, and especially to our children. And the lies are starting to corrupt our civilization from inside out" (Gray and Homer-Dixon 2011). The present generation should be prepared for discerning questions from the next generation.

- (1) Mom, what did you do to prevent climate change from stealing my future?
- (2) Dad, why is economic growth more important than the environment?
- (3) Grandmother, why are we still using fossil fuels when wind turbines, solar cells, and geothermal energy have been available for years?
- (4) Grandfather, what do people actually do at climate change conferences?
- (5) Uncle Aristotle, why are corporations given the same rights as humans?
- (6) Aunt Faith, what does the word *nurture* mean?
- (7) Why did people ignore the warnings given by scientists — are scientists bad people?
- (8) Didn't anyone know that radioactive substances last a long time?
- (9) When toxic chemicals get into the environment, where do they go?

Get Ready to Answer Now!

"The problem with the future is that it keeps turning into the present" (Watterson 2009). Humanity has very little time to acknowledge that it has been a major influence on climate change and that the fossil fuel era is over. If humanity fails to reach this acknowledgment, civilization is doomed and survival of *Homo sapiens* is increasingly threatened.

The most disturbing news is that the positive carbon feedback loop is rapidly growing. "Dramatic and unprecedented plumes of methane — a greenhouse gas 20 times more potent than carbon dioxide — have been seen bubbling to the surface of the Arctic Ocean by scientists undertaking an extensive survey of the region" (Connor 2011). If this growth is confirmed, especially if the scale of methane release increases, runaway climate change is the highly probable result. An angry, fearful global populace will be demanding an explanation for the failure to anticipate a number of global catastrophes by sovereign nations and their leaders and legislatures.

Flirting with Extinction

During the five previous great extinctions, extinction of species was estimated to be as high as 95%. These lost species were the basic components of the existing, at that time, Biosphere. The extinct species were replaced in evolutionary time. Of course, to even approach thinking in evolutionary time, one must accept the robust scientific evidence on which the concept is based, i.e., the evidence produced by the scientific process. Rejecting scientific evidence requires robust scientific evidence that no evolutionary process exists.

Conclusions

The preponderance of scientific evidence confirms that anthropogenic (human) activities (i.e., burning fossil fuel) are a major factor in climate change. The universal laws of biology, chemistry, and physics have caused climate change on Earth for approximately 4.5 billion years. However, *Homo sapiens* has only been on Earth for about 200,000 years and evolved in the environment of the sixth Biosphere, as did many millions of other species. Only the climate of the last 19,000 years has been very favorable, and, in this period, both the Agricultural and Industrial Revolutions occurred.

All complex systems have tipping points beyond which irreversible change occurs. At present, these tipping points are only evident in retrospect, but scientists may someday be able to predict when they will occur.

If the present Biosphere collapses, most of its component species will become extinct. The stress from the positive carbon dioxide feedback loop could cause the Biosphere to collapse as the ultimate tipping point. Of course, a nuclear war or an impact by a large object from outer space could also end the present Biosphere. Humanity may still have time to reduce anthropogenic carbon dioxide emissions or a nuclear war, but neither will be possible if policymakers disregard scientific evidence. Both the general public and the new media have a responsibility to see that this possibility is not neglected. Humankind must leave a habitable planet for posterity.

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LITERATURE CITED

- Aldag, R. 2011. Selective perception and subjective perception. iVillage 14Dec <http://forums.ivillage.com/t5/Breaking-News-Stories/Selective-perception-and-subjective-perception/td-p/118641575>
- Belleville, B. 2011. A meaningful goal for climate change. *Roanoke Times* 4Dec, Horizon, p. 3.
- Borenstein, S. 2011. Federal report: Arctic much worse since 2006. 1Dec USA Today <http://www.usatoday.com/weather/climate/globalwarming/story/2011-12-01/arctic-report-card-noaa/51549984/1>.
- Connor, S. 2011. Vast methane 'plumes' seen in Arctic Ocean as sea ice retreats. *The Independent* 13Dec <http://www.independent.co.uk/news/science/vast-methane-plumes-seen-in-arctic-ocean-as-sea-ice-retreats-6276278.html>.
- Davenport, C. 2011. Heads in the sand. *National Journal* 2Dec <http://www.nationaljournal.com/magazine/heads-in-the-sand-20111201>.
- Gray, D. and T. Homer-Dixon. 2011. Climate summit was a pathetic exercise in deceit. *The Globe and Mail* 12Dec <http://www.theglobeandmail.com/news/opinions/climate-summit-was-a-pathetic-exercise-in-deceit/article2267900/>.
- Kahneman, D. 2011. *Thinking, Fast and Slow*. Farrar, Straus and Giroux, New York, NY.
- Oreskes, N. and E. M. Conway. 2011. *Merchants of Doubt: How a Handful of Scientists Obscured the Truth from Tobacco Smoke to Global Warming*. Bloomsbury Press, New York, NY.
- Roberts, D. 2011. The brutal logic of climate change. *Grist* 5Dec <http://grist.org/climate-change/2011-12-05-the-brutal-logic-of-climate-change/>.
- Schuur, E. A. G. and Abbott, B. 2011. Climate change: high risk of permafrost thaw. *Nature* 480:32-33.
- Spotts, P. 2011. Global warming: winners and losers in the Arctic's 'new normal'. *Christian Science Monitor* 1Dec <http://www.csmonitor.com/Environment/2011/1201/Global-warming-winners-and-losers-in-the-Arctic-s-new-normal>.
- Watterson, B. 2009. Calvin & Hobbes. 31Dec Syndicated cartoon.