The Flooded Earth; Our Future in a World Without Ice Caps

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Source: Arctic, Antarctic, and Alpine Research, 42(4) : 498-499

Published By: Institute of Arctic and Alpine Research (INSTAAR), University of Colorado

URL: https://doi.org/10.1657/1938-4246-42.4.498b

Arctic, Antarctic, and Alpine Research, Vol. 42, No. 4, 2010, pp. 498–504

Book Reviews

THE FLOODED EARTH; OUR FUTURE IN A WORLD WITHOUT ICE CAPS. By Peter D. Ward. New York: Basic Books, a member of the Perseus Books Group, 2010. 256 pp. $25.95 (hardcover). ISBN 978-0-465-00949-7.

As I write, the U.S. Senate has just put aside any climate legislation for this session of Congress. Apparently resistance from

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cap-and-trade opponents for carbon reduction is just too strong. A while back, the Copenhagen conference did not accomplish anything significant toward reduction in greenhouse gasses, mainly CO_2. On 27 July 2010, NOAA reported that the past decade was the warmest on record. A report issued 16 July by the U.S. National Research Council indicates that the "Earth is now entering a new geological epoch the 'Anthropocene' during which the evolution of the planet's environment will be largely controlled by … emissions of carbon dioxide." Readers of *The Flooded Earth*, the dramatically titled book by geologist Peter Ward, should be very concerned.

The Introduction sets the tone and style of the book by hypothesizing Miami in 2120 with carbon dioxide at 800 ppm. The sea had risen 10 feet and the city became an island, because Greenland lost its ice cover. Despite a quibble I have about whether all of Greenland's melting ice could raise sea level 10 feet (a significant amount of meltwater would be contained by present subglacial mountains), the metaphor is appropriate, because the West Antarctic Ice Sheet and small glaciers would likely make up the difference. A few quotes capture the picture: "the federal government could not afford to save a city like Miami," "here and there the rich mansions of Key Biscayne remained places of luxury for those whose fortunes remained. As always money could still make a difference."

The author brings his geological background to the book, which is perhaps his most significant new contribution. He notes that much of "what we know about the new increase in sea level comes from what we have discovered about the very old rises and falls of the sea." As a paleontologist, Ward has professionally studied the effects of rising and falling sea level from far more ancient times.

Ward uses this "dramatic example" style throughout the book, providing illustrations of various future times and areas of Earth, which makes for a lively presentation. However, a bit more editing would have made the transitions from the "dramatic examples" smoother. The first six chapter titles: *The Rising Sea*; *Rising Carbon Dioxide*; *The Flood of Humans*; *Feeding Humanity Amidst Rising Sea Level*; *Greenland*, *Antarctica*, *and Sea Level*; *Flooding of Coastal Countries and Cities*, outline the presentation well. The author cogently discusses the effects of increasing population, energy needs, and food supply problems as related to increases in greenhouse gases. As pointed out by numerous authors, coal, the largest source of CO_2, will be the greatest challenge to cut back on, as energy demand increases. Ward points out that "the nature and timing do not enhance planning or mitigation. … **planning for effects that will kick in many decades in the future is not something that governments do**."

The sobering seventh chapter, *Extinction?*, presents the author's contention that within "several millennia (or less) the planet will see a changeover of the oceans from their current mixed state … to stratification by oxygen content and temperature, with warm oxygen-free water lining the ocean basins." He points out that "like this in the past (and they were present for most of Earth's history) stratified oceans have always been preludes to biotic catastrophe."

The eighth and final chapter, *Stopping Catastrophic Sea Level Rise*, assumes that even if humans hold the carbon dioxide emissions, geoengineering solutions will be required, which he discusses at some length. I am not (and I suspect the author is not) very happy with this approach. Yet as Ward points out, "survival does not mean a high quality of life." As a final note he postulates two scenarios:

(1) *2400 CE at 1200 ppm CO_2*, at 24 feet sea level rise, a nuclear attack by India on Bangladesh to prevent mass migration, and

(2) *Old Seattle, 5515 CE, CO_2 at 1200 ppm*, at 240 feet sea level rise. A small hill a few dozen feet above sea level, where Anthropogenic-age Queen Ann Hill had stood. … "Puget Sound and the Straits of Georgia were among the first to go. … Salmon had disappeared early in the twenty-first century … thanks to the steadily rising thermocline—the border between oxygenated surface water and anoxic bottom water."

There are a few errors. Table 3.1 cites population of "northern" America, excluding Latin America and the Caribbean, as 915,000,000 at present. That seems high for US and Canada. In the Antarctic map of Figure 5.2, the bed topography beneath the West Antarctic Ice Sheet is half a century out of date. It looks like an old map of about 1960. This is important because the author discusses the deglaciation of West Antarctica and consequent sea-level rise at some length. In Table 4.1, "Predicted Percentage Crop Yield Gain or Loss by 2080," it seems strange that the U.S. is omitted.

The end notes and references and index are outstanding. There is a nice balance between printed publications and material available on the web. I suspect that in 50–100 years, when many predicted effects of climate change will be more apparent, the web references will no longer be accessible. But the printed material may still be in libraries. In note 2 of Chapter 5, Ward quotes a friend and former INSTAAR colleague, Eric Steig, as pointing out that one paper on the future of the West Antarctic Ice Sheet should be read "only if you want the shit scared out of you." The author points out that one of the best sources of data is the award-winning website RealClimate.org. He notes that "much of this book is based on information published or referenced there." In summary, THE FLOODED EARTH is an excellent reference for the educated lay person, and scientists will also learn a lot because it covers many relevant disciplines.

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