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Preface to *Climate Peril*

During some 40 years of professional work I have been deeply concerned about the effects of human activities on the environment. My focus was originally on the environmental impacts of energy technologies. After studying the energy options globally available, I was convinced by the mid-1970s that the most economically and environmentally sound way forward required the vigorous adoption of renewable energy and efficiency technologies. In the decades and books that followed, I strongly advocated for those technologies and for more intensive use of environmental restoration technologies to repair damaged natural resource systems.

Through all these concerns, I came to the study of climate change in the 1980s and now view it as the paramount issue of our time. It affects all humanity as well as the entire Earth, together with all its ecosystems.

Climate Peril: The Intelligent Reader's Guide to Understanding the Climate Crisis was written not only to explain the causes of climate change and the natural science needed to understand its effects, but most importantly, to convey the catastrophic impacts on plants, animals, human health, and economic welfare to which a continuation of rapid climate change is currently leading.

To bring this enormous story to life, *Climate Peril* ranges from the Himalayan glaciers to the ocean depths; from the melting Greenland Ice Cap and thawing permafrost to the tropical rainforests of the Amazon; from the African Sahara to the melting methane ice crystals beneath the polar seas; and from America's mountain snowpacks to its seashores and coastal cities. I hope the book conveys a clear understanding of how and why climate change occurs; its human origins; its extraordinary speed; and most of all, that catastrophic events have already begun.

To set the stage for this epic story, *Climate Peril* explains key scientific ideas and concepts, such as the role that carbon dioxide and other long-lived, heat-trapping gases play in the climate system, as well as positive feedback processes and tipping point risks. But even if you are a newcomer to climate change issues, you will not need any prior knowledge to read the book. You can do so quickly for general understanding or more intensively for in-depth knowledge.

My goal in *Climate Peril* is to show why climate change is the most critical threat to the planet today, and why we need to muster an emergency response. *Climate Peril* is the second in a series of three books. The first was *Climate Myths: The Campaign Against Climate Science* (Northbrae Books, 2013). The discussion in *Climate Peril* of the processes that cause climate change and its physical, biological, and economic impacts is, I believe, vital for understanding the need for the solutions proposed in the third book of this series, *Climate Solutions*: *Turning Climate Crisis Into Jobs, Prosperity, and a Sustainable Future* (forthcoming). That final volume provides an overview of the technologies available for mitigating climate change and the strategies plus tactics required to ensure that essential

climate policies are implemented, despite even the most formidable obstacles.[1] Before proceeding further, a note about temperature: All temperatures in the US edition of *Climate Peril* are in Fahrenheit; information for converting temperature to Celsius is provided on page xx.

The Perils We Face

Tragically, it is now apparent that human activity has already triggered massive and rapid global climate change. The reason is clear: we have raised the concentration of heat-trapping gases in the atmosphere to levels not seen on the planet for millions of years. Chapter 3 explains how these gases serve as a planetary thermostat that influences its temperature and how long they will persist in the atmosphere.

If we continue business as usual and go on increasing those emissions, the Earth's average temperature is likely to rise by 7 to 11°F or more by 2100, with far greater heating on land than at sea, in the continental interiors, and in the Arctic.[2] Moreover, this transitory 2100 temperature response will ultimately be greatly exceeded over carbon dioxide's millennial atmospheric lifetime as Earth's temperature rises to a final equilibrium dictated by the enduring atmospheric presence of this, and other, long-lived greenhouse gases.

World-renowned climate scientist James Hansen, lately of NASA's Goddard Institute for Space Studies, warns that, "even 2°C [3.6°F] warming is a disaster scenario, as warm as the Pliocene a few million years ago, when sea level was 50 feet higher. It would lead to a different planet, not immediately, but with ongoing change out of humanity's control."

An 11°F rise would be *three times hotter* than the 3.6°F of additional heating that Dr. Hansen warns would already be a "disaster scenario." Some experts, however, have projected that if we continue with our current carbon emissions policies, we are on track to reach 11°F not by 2100 but far sooner.

While we don't know exactly how much more global heating gases the atmosphere can hold before the world's average temperature rises beyond 3.6°F, we are apparently very close, if not already past, the point at which it might already be too late to avoid a 3.6°F increase by 2100 or earlier.

The effects of overheating the planet would not be limited to extreme weather, droughts and widespread water shortages, along with inevitable famine. As explained in chapter 11, it would also upset the chemistry of the oceans with disastrous consequences for marine life and all who depend on it for food and livelihood. Meanwhile, people living by the ocean would face rapidly rising sea levels and flooding, leading to the abandonment of much of what we today consider our coastline.

Professor Corinne Le Quéré, lead scientist of the British Antarctic Sur- vey, headed a recent study published in *Nature Geoscience* that chronicled the world's rapidly rising emissions. She warned that the billions of tons of carbon dioxide we are now discharging to the air each year may be gradually reducing the ocean's critically important ability to absorb excess carbon dioxide.

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[1] The forerunner of the current three-book series is an earlier climate book of mine, *Beating the Heat: Why and How We Must Combat Global Warming* (Berkeley Hills Books, 2000). Where relevant, portions of *Beating the Heat* have been integrated into the current volumes, which greatly expand, extend, and update the earlier material.

[2] Some sophisticated climate models project that 4°C could be reached as early as 2060 if emissions continue their rapid increase.

The ocean currently takes up about half of the carbon dioxide that human activity has discharged to the atmosphere. Therefore, if the ocean's ability to moderate the effects of additional carbon dioxide emissions is impaired, the climate will heat up even more quickly than projected.

With global temperature rising steeply, mass extinctions of both land and water species are inevitable. In fact, extinction rates are already at exception- ally high levels. As described in chapter 10, wonders of nature—some as yet unknown, many still little-studied and poorly understood—are vanishing from the planet forever. Entire regional ecosystems will be destroyed, along with the life-support functions they provide us.

As chapter 8 relates, in the hotter world that is developing, tropical diseases will spread northward from the tropics. Weeds and other invasive pest species will become more prevalent. Insufferable heat waves that prove fatal to the young, the old, the weak, and the infirm will become far more common.

These effects, compounded together, will eventually but inexorably translate into thirst, hunger, starvation, disease, displacement, despair, and death for hundreds of millions of people. An intensification of global resource conflicts and heightened risk of major wars is also expected as swelling populations with increased resource demands encounter a shrinking, climate-devastated resource base. This has already been observed in places as diverse as Nigeria and Syria. Survivors will lament that timely measures were not taken to head off the consequences of climate change that for decades loomed large but virtually neglected on our horizon.

It still *may* be possible to avoid the worst impacts of climate change by rapidly scaling back carbon dioxide and other emissions. We need to reach for that possibility with all our might and deliberate speed by reducing carbon dioxide and other heat-trapping gas emissions as quickly as possible.

Fortunately, the peoples of the Earth do collectively have the knowledge, skill, wealth, and natural resources needed to shift the planet from carbon-based fuels to carbon-free (and carbon-neutral) renewable energy. Moreover, the climate-safe technologies the world needs are genuinely avail- able, and the clean, safe energy flows they utilize—from the sun, wind, water, and Earth—are timeless and abundant.

Thus, from a technological standpoint, all the ingredients needed to protect the climate are at hand. But the educational, political, and economic obstacles are daunting and unprecedented. Underscoring that, the United States and other nations have so far lacked the will and political leadership to really launch this process.

Let's get started now to deepen our understanding of climate change's causes and effects. Armed with this knowledge, those who choose to do so will be in a better position to work for climate protection. As noted earlier, detailed recommendations and analysis about what should be done about cli- mate change can be found in the final volume of this series, *Climate Solutions: Turning Global Crisis Into Jobs, Prosperity, and a Sustainable Future.*