

# Earth 2020

An Insider's Guide to a Rapidly  
Changing Planet



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# Impatient Earth

—  
*John Harte and Robert Socolow*

Fifty years ago, the two of us wrote an introductory textbook, *Patient Earth*, about a range of environmental problems that were coming into focus as we entered the final decades of the twentieth century.<sup>1</sup> Our book told its story partially through ten contemporary site-specific case studies, which were chosen based on their likely staying power — would they be relevant in fifty years? All of them are.

Recently, we discussed the need for a new, updated *Patient Earth*, in which fifty intervening years of developments in environmental science and policy would be presented. Soon thereafter, we met Philippe Tortell and discovered that he was gearing up to write just such a book. *Earth 2020*, as he described it, would cover a comprehensive set of topics, with chapters authored by global experts in each field. We were thrilled to be asked to contribute some perspectives to this timely book, which we expect to be relevant still, half a century from now.

Comparing and contrasting our book with this present volume, *Earth 2020*, can teach all of us a lot about how the world has changed over the past half-century, and what the future may yet hold. For one thing, *Patient Earth* was the product of a white, male, upper-class world, with only two female authors, and an antediluvian treatment of pronouns. For another thing, *Patient Earth*, unlike *Earth 2020*, could not have looked back fifty years. In 1970, environmentalism had much less of a past than it does today. At that time, it was

a frontier; now, it is mainstream. We did have an essay by Paul Sears that looked back nearly fifty years to the Dust Bowl calamity of the 1930s, and considered ‘the inseparable tie between the good earth and human destiny.’<sup>2</sup> We paired that essay with another, by Jeremy Sabloff, that looked even further back, to the collapse of the Maya civilization.<sup>3</sup> The word ‘sustainability’ hardly existed in 1970, but these two essays did call attention to risks to the continuity of civilization.

In our introduction to those two ‘Lessons from the Past’, we noted that the Dust Bowl tragedies resulted from farmers, ranchers and land developers ignoring the warnings of soil scientists and agronomists. The Maya, we suggested, did not see the consequences of their population growth under limited land resources, and lacked the knowledge to make the metal tools that might have extended their farmland. We wrote: ‘Every society has its blind spots and from a distance one’s reactions to them are instinctively charitable. But to the deaf spots in a society, how should one respond?’<sup>4</sup>

Let us turn that judgmental spotlight upon ourselves, and assess our choices of topics in *Patient Earth*. Which warnings did we hear, which could we have heard if we had paid attention, and which did we not hear because they did not yet exist? Such analysis can provide insight, more generally, into how society can learn to open its ears.

In 1970, environmentalism was deeply intertwined with three other contemporary concerns: wilderness and the non-human environment, militarism and population. We were determined to address all three. Notably, they are scarcely present in the collection of topics addressed in *Earth 2020*.

To emphasize wilderness and the non-human environment, we recruited an essay by Albert Hill and Michael McCloskey about how the High Sierras in California were about to be invaded by a ski resort,<sup>5</sup> and another by Kent Shifferd about how the remote woods of northern Wisconsin were threatened by an immense transmitter for submarine communications.<sup>6</sup> We also wrote our own essay on the menace to the Florida Everglades presented by a proposed international jetport west of Miami.<sup>7</sup> Activists battled all three, and none were built. Today, environmental organizations present the need to protect the environment in largely instrumental terms, stressing the direct benefits to humans (clean air and water, and carbon storage, for example). We straddled this breach ourselves. In

our essay on the Everglades, we highlighted the negative human impacts resulting from the degradation of nature and noted how ‘the well-being of man (*sic*) and the park, in quite direct and material ways, are critically linked’,<sup>8</sup> a notion now referred to as ‘ecosystem services.’ But we could not have guessed then that fifty years later, there would be mounting evidence for declines in the numbers and diversity of insects, including the pollinators that sustain our food supply.

The second concern, militarism, was very much alive in 1970. At the time, the US was still prosecuting the Vietnam War. There is an essay in *Patient Earth* by Arthur Galston on the use of defoliating herbicides in Vietnam to open up its forests to US bombers,<sup>9</sup> and a primer on radioactivity, addressing both nuclear weapons and nuclear power, which we wrote with Joseph Ginocchio.<sup>10</sup> At the time, avoiding nuclear war was the primary objective among physicists like us who engaged with public affairs. It still ought to be. We had blind spots, of course. We never made the connection between climate refugees and war, nor did we consider oil fields as potential military targets.

The third concern — population — was discussed in practically every environmental textbook in 1970. *Patient Earth* has an appendix on demography (by us), an essay on population by Alice Taylor Day and Lincoln Day,<sup>11</sup> and an essay by Richard Lamm about one of the first state-level initiatives in the US (in Colorado) to loosen the restrictions on abortion.<sup>12</sup> Today, “environment” has distanced itself from “population” in most discourse. Yet, the global population has doubled in the past fifty years and is still climbing, greatly complicating many environmental problems and their solutions. An inexcusable number of women and men still have unwanted children because they have no access to contraception and are unable to exercise freedom over their own reproduction. If *Earth 2020* had included an essay surveying critical population issues over the past fifty years, it would probably have noted that *Patient Earth*, and almost everything written about population in the 1970s, underestimated the demographic transition that would unfold over the subsequent half-century. Today, populations are falling in some countries, and a critical question with environmental significance is whether a similar downward trend will emerge worldwide. If that happens, the global population will decrease, and our species will have an easier time accommodating to this small, shared planet.

In 2020, these three previous concerns have been replaced by two new ones: planetary-scale thinking and environmental justice. We emphasized the first in *Patient Earth*, but to the second we were deaf.

Although *Patient Earth* deliberately focused on US issues in its case studies, again and again it zoomed outward to treat the planet as a whole. We presented the Earth as a single system that could be overwhelmed by human activity in ways that resemble anthropogenic impacts on lakes and airsheds. We taught the reader to perform calculations relevant to global warming, and observed that ‘it is ominous that our capacity to change our planet has outrun our understanding of what is happening’.<sup>13</sup> We couldn’t have anticipated an ozone hole driven by chlorofluorocarbons (CFCs), but we could have come close; the effect of supersonic airplane emissions on stratospheric ozone was already a live issue.

We did not deal with ocean acidification adequately. We described how the oceans had taken up a portion of anthropogenic CO<sub>2</sub> up to 1970, and commented, briefly, on the increasing acidity of surface ocean waters. We explained chemical buffering, and how increasing the ocean’s acidity reduces its capacity to take up more CO<sub>2</sub>. But we utterly failed to point out that an increase in acidity was a threat to the ecological integrity of the oceans. We didn’t ignore warnings about ocean acidification because there were none then, but we also didn’t listen to our own words and pursue their consequences.

The essay about resource scarcity by Charlotte Alber Price — on helium conservation programs — adopted an entirely US perspective.<sup>14</sup> We wrote nothing about world hunger, or ice, or sea level or the world’s forests and fisheries — all treated in *Earth 2020*, which is globally-focused throughout. Both books are silent on the overuse of antibiotics, and uncontrollable epidemics — topics that must also be brought into the discussion.

Much of the planetary thinking in *Patient Earth* is at the societal level. Herman Daly, at our invitation, contributed an essay that was the first publication of his path-breaking ideas about ‘the Equilibrium Society,’ where material flows through an economy reach a plateau.<sup>15</sup> Such zero-growth arguments remain unfashionable (and incomprehensible to economists) today, in about the same way as they did fifty years ago. That essay was complemented by a contribution from Richard Falk on the need to strengthen the international institutions

managing the global environmental commons,<sup>16</sup> an argument that is at least as relevant now as then.

*Patient Earth* did not have a single essay on environmental justice, and, fifty years later, neither does *Earth 2020*. Yet, morally and politically, both within and between countries, inequality and equity are dominant issues. Living and working in New Haven, Connecticut, in 1970, we were surrounded by the symptoms of injustice. Poverty was acute in the city, with the worst local air quality and the major disruptive traffic arteries in the poor neighborhoods. Racial environmental injustice accompanied income-based environmental injustice. The closest we came to addressing this issue in *Patient Earth* was in an essay by H. Lyle Stotts, an emergency room doctor in Bridgeport, Connecticut, who, single-handedly and without community support, was bandaging urban sores.<sup>17</sup> We included the essay to provide an example of what the individual, working alone, can accomplish, but failed to draw a wider circle to include the systemic issue of environmental injustice.

Our light treatment of the intersection between poverty and environment was a consequence of our focus on the environmental problems generated by high consumption. The dominant perspective in *Patient Earth* is that the rich are overconsuming, and the dominant objective from the environmental perspective is to ‘decouple’ (a word introduced around that time) growth in well-being from growth in material flows. Overconsumption was then, and still is, a dissonant idea.

Both *Patient Earth* and *Earth 2020* emphasize pollution. In 1970, people described the two components of environmentalism as the green and the brown. The green is the protection of unspoiled areas; the brown is the repair of spoiled areas. *Patient Earth* includes not only the already cited essays on herbicides and radiation, but also Alfred Eipper’s essay on the overheating of a lake by a nuclear power plant,<sup>18</sup> another by Austin Heller and Edward Ferrand on sulfur dioxide emissions from burning coal,<sup>19</sup> and a third by Ori Loucks on the effort to ban dichlorodiphenyltrichloroethane (DDT) in the US.<sup>20</sup> *Earth 2020* discusses plastics, space junk and contaminants in general. We are glad that plastics have an essay, and that it includes micro-plastics. We could not have anticipated the damage to wildlife caused by these fine plastic particles, a huge problem already today and growing ever larger; photographs of the plastics in the gut contents of wild animals are becoming

hard to ignore. There is even credible evidence that these plastic particles move from our food and drinking water to our brains.

*Patient Earth* did not anticipate endocrine disruptors. Yet, the subsequent brilliant work of Theo Colborn and others on hormone-imitating synthetic chemicals in the environment uncovered a major threat to the health of humanity. One could say that we anticipated this issue, because Galston's essay on herbicide use in Vietnam includes discussion of its teratogenic effects, while Loucks's essay on DDT explains how DDT-induced enzymes produce estrogen breakdown.

*Patient Earth* was driven by a three-component model of social change: science-policy-activism. Underlying *Earth 2020*, we infer, is the same model, but it is not prominent. The three components work together, not sequentially. The science is well-enough understood to enable the problem and its potential solutions to be identified. The activists use the science to scope the problem, to reduce surprise, and to critique solutions. The solutions require innovations in policy that activists formulate and governments enact. Indeed, the years immediately after 1970 featured a burst of innovative legislation in the US and elsewhere addressing air and water pollution, toxic chemicals and endangered species. Also at that time came legal requirement to evaluate environmental impacts.

The concept of 'well-enough understood science' is a loaded one. Scientists will always want more information, and there are numerous puzzles in any field of science to keep its practitioners busy. But when is the science sufficient for taking action? We have looked back at the progress on the various issues raised in *Patient Earth*, from climate change to biodiversity, from toxics to reproductive freedom, and from warfare to economic sustainability. In each case, we asked whether there was sufficient science in 1970 to know whether action in the form of public policy was needed. We concluded that, yes, the science was generally sufficient to impel such action. Also, the activists' level of awareness was generally high. But the conceptualization of, and commitment to, effective policy was woefully lacking. The imbalance is about the same today.

How much the impacts have grown in fifty years! And the tasks have become more challenging too, despite more relevant science and technology, more policy savvy and more

social engagement. Two thirds of the entire increase in atmospheric CO<sub>2</sub> concentrations since ‘pre-industrial times’ has happened since 1970.<sup>21</sup> What will the next fifty years bring? Leaving aside changes in power politics (*Patient Earth* did not anticipate the rise of China or the fall of the Soviet Union), what about our understanding of the natural environment? Many of the authors of the essays in *Earth 2020* end on an optimistic note. We did, as well. Will people be optimistic fifty years from now about the fifty years after that?

The science today is sufficient to justify activism and policy on many problems, but that is not a reason to slow the scientific quest. As we write, perhaps somebody working at a laboratory bench, or sampling soil in a warming tundra bog, or collecting demographic data for an agency, has a new insight. Maybe we will learn to think more about the deteriorating acuity of our senses resulting from our growing addiction to electronic media. Perhaps we will learn that essential microbes in our guts are being poisoned by the pesticides in our diet, or that our immune systems are being compromised by living in overly sterile homes, or that intense heat waves are harming our brains, or that overfishing is affecting the capacity of the oceans to function as a carbon sink.

In our future, we will have new capabilities to modify organisms, thanks to CRISPR and other tools of the biomedical revolution. We will probably be wrestling with an electricity system largely dominated by energy that is not at our beck and call, because of night and clouds and doldrums. We may be dealing again with nuclear power. And we are likely to be sorting out geoengineering — the deliberate modification of the planet for ‘human betterment.’ Both ‘human’ and ‘betterment’ will be vexing issues: not only which countries get to define ‘betterment’ (not every country wants less warming), but which trade-offs need to be taken into account so as not to debilitate the non-human while attending to the human. Clearly, the broad enterprise of science must continue, as must the active public engagement of concerned scientist-citizens, such as those we featured in the *Patient Earth* case studies.

The title of our book invoked the twin meanings of ‘Patient.’ We are in a caring relationship to Earth, as a doctor is to a patient. And in 1970, Earth was willing to wait patiently, as we worked through a diagnosis and searched for appropriate treatment. Half a century on, in 2020, Earth is still our patient, but it has become impatient. The two of us,

today, hope, but are by no means certain, that there is yet more time. We are not willing to assert Game Over. At every future moment, there will be better and worse choices, and it will matter which are chosen.

## *Endnotes*

1. We are both authors and editors of *Patient Earth*, New York: Holt, Rinehart and Winston, 1971.
2. Paul Sears, 'An empire of dust,' in *Patient Earth*, 2–15, at 2.
3. Jeremy A. Sabloff, 'The collapse of the classic Maya civilization,' in *Patient Earth*, 16–27.
4. John Harte and Robert H. Socolow, 'Lessons from the past,' in *Patient Earth*, 1.
5. Albert Hill and Michael McCloskey, 'Mineral King: Wilderness versus mass recreation in the Sierra,' in *Patient Earth*, 165–80.
6. Kent Shifferd, 'The fight against Project Sanguine,' in *Patient Earth*, 151–63.
7. John Harte and Robert H. Socolow, 'The Everglades: Wilderness versus rampant land development in South Florida,' in *Patient Earth*, 181–202.
8. *Ibid.*, 182.
9. Arthur W. Galston, 'Warfare with herbicides in Vietnam,' in *Patient Earth*, 136–50.
10. John Harte, Robert H. Socolow and Joseph N. Ginocchio, 'Radiation,' in *Patient Earth*, 295–320.
11. Alice Taylor Day and Lincoln H. Day, 'Toward an equilibrium population,' in *Patient Earth*, 206–25.
12. Richard D. Lamm, 'Abortion: A case study in legislative reform,' in *Patient Earth*, 58–69.
13. John Harte and Robert H. Socolow, 'Energy,' in *Patient Earth*, 294.
14. Charlotte Alber Price, 'The Helium Conservation Program of the Department of the Interior,' in *Patient Earth*, 70–86.
15. Herman E. Daly, 'Toward a stationary-state economy,' in *Patient Earth*, 226–44.
16. Richard A. Falk, 'Adapting world order to the global ecosystem,' in *Patient Earth*, 245–57.
17. H. Lyle Stotts, 'Window to the city: The emergency room,' in *Patient Earth*, 31–40.

18. Alfred W. Eipper, 'Nuclear power on Cayuga Lake,' in *Patient Earth*, 112–34.
19. Austin Heller and Edward Ferrand, 'Low-sulfur fuels for New York City,' in *Patient Earth*, 42–57.
20. Orie L. Loucks, 'The trial of DDT in Wisconsin,' in *Patient Earth*, 88–111.
21. See also 'Carbon' by David Archer in this volume.

