

# 1 INTRODUCTION

Humankind must accept stewardship of Planet Earth and urgently act on it.

It used to be that only climate activists, environmentalists and street protestors talked about “saving the Earth.” Today, this sentiment is expressed by nearly everyone – from citizens to academics to government officials and boardroom executives.

At the 2020 World Economic Forum in Davos, Peter Brabeck-Letmathe, former chairman and CEO of Nestlé, announced:

Planet Earth is sick . . . so we have to heal it.<sup>1</sup>

And, as Partha Dasgupta explained in his landmark review of *The Economics of Biodiversity*:

The solution starts with understanding and accepting a simple truth: our economies are embedded within Nature, not external to it.<sup>2</sup>

This shift in sentiment, although welcome, has been a long time coming.

In the 1960s, the economist Kenneth Boulding argued that humankind’s future depends on transforming the current “cowboy economy,” which treats Earth’s resources and sinks as essentially limitless, to a “spaceman economy” that respects the finite biosphere of “Spaceship Earth.” Boulding contrasted these two economies in this way:

I am tempted to call the open economy the “cowboy economy,” the cowboy being symbolic of the illimitable plains and also associated with reckless, exploitative, romantic, and violent

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behavior, which is characteristic of open societies. The closed economy of the future might similarly be called the “spaceman” economy, in which the earth has become a single spaceship, without unlimited reservoirs of anything, either for extraction or for pollution, and in which, therefore, man must find his place in a cyclical ecological system which is capable of continuous reproduction of material form even though it cannot escape having inputs of energy.<sup>3</sup>

In the 1970s, the historian Arnold Toynbee noted that humankind has always exploited nature with little regard of the environmental impact. Whereas previously we only “devastated patches of the biosphere,” this changed with the Industrial Revolution. It gave us the “power to damage and despoil the biosphere irremediably”:

Before the Industrial Revolution, Man had devastated patches of the biosphere . . . But, before he had harnessed the physical energy of inanimate nature in machines on the grand scale, Man had not had it in his power to damage and despoil the biosphere irremediably. Till then, the air and the ocean had been virtually infinite, and the supply of timber and metals had far exceeded Man’s capacity to use them up. When he had exhausted one mine and had felled one forest, there had always been other virgin mines and virgin forests till waiting to be exploited. By making the Industrial Revolution, Man exposed the biosphere, including Man himself, to a threat that had no precedent.<sup>4</sup>

Ten years later, the scientist James Lovelock elaborated on the possible dire – and irreversible – consequences if we fail to curtail global environmental degradation:

Anything that makes the world uncomfortable to live in tends to induce the evolution of those species that can achieve a new and more comfortable environment. It follows that, if the world is made unfit by what we do, there is the probability of a change in regime to one that will be better for life but not necessarily better for us . . . The things we do to the planet are not offensive nor do they pose a geophysiological threat, unless we do them on a large enough scale . . . When all this is taken into account we are indeed in danger of changing the Earth away from the comfortable state it was once in.<sup>5</sup>

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Several decades on, the world may be beginning to heed the warnings of Boulding, Toynbee and Lovelock, but we have yet to halt the “danger of changing the Earth away from the comfortable state it was once in.”

According to the Intergovernmental Panel on Climate Change (IPCC), by failing to reduce global greenhouse gas emissions, we are destined to live in “a world of worsening food shortages and wildfires, and a mass die-off of coral reefs as soon as 2040 — a period well within the lifetime of much of the global population.”<sup>6</sup> Mammals and other species may also be on the verge of “biological annihilation” as forests and other natural habitat continue to be converted and degraded.<sup>7</sup> Currently, at least one-third of fish stocks are overfished; one-third to half of vulnerable marine habitats have been lost; and a substantial fraction of the coastal ocean suffers from pollution, eutrophication, oxygen depletion and is stressed by ocean warming.<sup>8</sup> Rising freshwater scarcity is a present-day danger for the 1.6–2.4 billion people currently living within watersheds with inadequate supplies and exposed to climate change.<sup>9</sup>

Unless we control these alarming trends, they could endanger the health and livelihoods of millions and the sustainability of our economies. Even in a world recovering from the worst health pandemic in more than 100 years and the deepest economic recession since the Great Depression of the 1930s, humankind’s devastating impacts on the biosphere remain our biggest global challenge.

So, it is not surprising that, in its first global survey since the COVID-19 outbreak, the World Economic Forum found that four environmental risks – plus the threat of infectious disease outbreaks – are the top five global threats to humankind.<sup>10</sup> These four risks are: extreme weather, climate action failure, human environmental damage and biodiversity loss.

All of these trends and concerns suggest that humankind’s relationship with the biosphere is at a critical juncture. Planet Earth could be on the cusp of destabilization, and we may not have many years left to change this path.

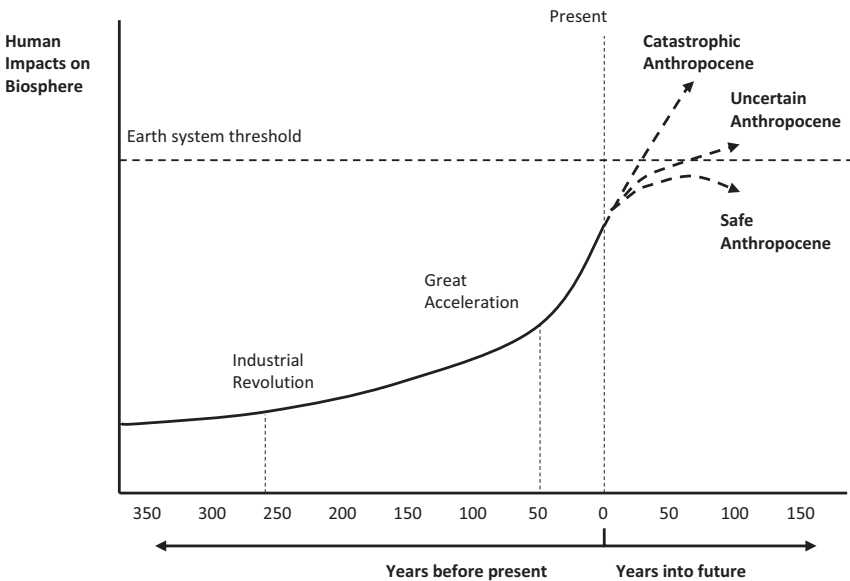
## The Anthropocene

Human impacts on Earth are now so significant that we have created an entirely new geological epoch – the *Anthropocene*.<sup>11</sup> This era began with the late twentieth-century “Great Acceleration” of

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population growth, industrialization and mineral and energy use, and has continued unabated since.<sup>12</sup> Human activity has become the dominant influence on the global environment. We are altering basic Earth system processes at an increasing rate through climate and land use change, pollution, freshwater use and many other impacts. As a result, the Earth system could be approaching a “tipping point” that could change it irrevocably, with potentially disastrous impacts for humanity.<sup>13</sup>

We do not really know what will happen once this Earth system threshold is crossed (see Figure 1.1). The system may well be out of human control or influence, and will be driven by its own internal dynamics. But if the Great Acceleration continues, one possible outcome is a “catastrophic” Anthropocene, with global warming of 2–4°C or



**Figure 1.1** Human impacts on Planet Earth

*Notes:* Since 1970, rapid industrialization, population growth, resource use and pollution have caused a “Great Acceleration” in human impacts on the biosphere. If these impacts continue, in a few decades we could produce a “catastrophic” Anthropocene that would threaten humanity. Even if human impacts are moderated somewhat, crossing the Earth system’s threshold would lead to an “uncertain” Anthropocene with unpredictable consequences for the planet. Only by reducing human impacts significantly over the next few decades are we likely to avoid exceeding the Earth system threshold, or “tipping point,” and create a relatively “safe” Anthropocene.

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more, massive biodiversity losses and species extinction, chronic fresh-water scarcity and other unknown environmental disruptions.<sup>14</sup> If we exceed the Earth system threshold, we could end up in an “uncertain” Anthropocene, where the environmental consequences are difficult to predict and would likely cause serious, and possibly irreversible, damages to ecosystems, society and economies. Only if we act now, and with sufficient efforts to “decouple” human impacts on the planet from economic activity and continued population growth, are we likely to be able to maintain a “safe” Anthropocene that evades Earth’s “tipping point.”

Some scientists advocate that, to prevent an uncertain or catastrophic Anthropocene, human impacts on the global environment must be kept within the “planetary boundaries” that protect key Earth system processes. They suggest that there are “nine such processes for which we believe it is necessary to define planetary boundaries: climate change; rate of biodiversity loss (terrestrial and marine); interference with the nitrogen and phosphorus cycles; stratospheric ozone depletion; ocean acidification; global freshwater use; change in land use; chemical pollution; and atmospheric aerosol loading.”<sup>15</sup>

Although there are disagreements over this “planetary boundary” perspective, there is growing scientific consensus that Planet Earth is increasingly fragile, and it is no longer a problem that we can leave future generations to fix. Global environmental change is occurring now, already affecting the lives and livelihoods of billions today, and only getting worse as we delay actions to deal with it. The longer we wait, the more the costs of inaction rise and the risk of potentially catastrophic change occurs. As the scientists Timothy Lenton and Hywell Williams conclude, “regardless of whether it is approaching a global tipping point, we can all agree that the biosphere is in trouble.”<sup>16</sup>

We cannot afford to wait any longer. It is now time for humanity to accept stewardship of Planet Earth and to act on it.

This is the contribution of the following book. It begins with acknowledging the “simple truth” – as the quote by Partha Dasgupta so eloquently states – that “our economies are embedded within Nature, not external to it.” This modest yet powerful change in our economic view of the world can help guide how we rethink our markets, institutions and governance. And, from these changes, flow a plethora of new incentives, innovations and investments that can transform our economies to become more sustainable and inclusive.

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The purpose of this book is to start this process of more innovative thinking on economics and policies for an increasingly “fragile” planet. It requires addressing three crucial questions:

- How do we reduce human impacts on the biosphere to ensure a safe Anthropocene, and if so, what are the implications for our markets, institutions and governance?
- As environmental risks continue to mount, how do we design and run our economies to avoid and mitigate these risks in an inclusive and sustainable manner?
- What policies are required to “decouple” wealth creation and economic prosperity from environmental degradation, to sustain per capita welfare and simultaneously limit environmental risks?

These questions need to be addressed urgently. They represent the major sustainability challenge facing the world today. Yet current economic and policy thinking has largely ignored them.

Throughout this book, we will explore why this has to change and how to do it. The first step is to approach the relationship between nature and economy differently than we have in the past. Tackling the sustainability crisis requires new ways of viewing the world around us, and that in turn, requires some principles to guide economic and policy thinking.

This book proposes five such principles:

- Ending the underpricing of nature
- Fostering collective action
- Accepting absolute limits
- Attaining sustainability
- Promoting inclusivity

These principles underlie the approach to economics and policy taken in this book.

### **Underpricing Nature**

Ending the *underpricing of nature* is listed as the first principle, as it lies at the heart of the sustainability crisis.

The failure to take the true value of the environment into account is pervasive in all economies. Poor institutions and governance further exacerbate this disincentive, thus fostering even more environmental mismanagement.

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This book explores how improving markets, institutions and governance can correct the underpricing of nature, and ultimately, enhance the ability of economies to meet the environmental challenges of the Anthropocene.

Economists have always maintained that the key measure of an economy's progress is its ability to create wealth. Today, it is widely recognized that the "real wealth" of a nation comprises three distinct capital assets: manufactured *physical capital*, such as roads, buildings, machinery and factories; *human capital*, such as skills, education and health embodied in the workforce; and *natural capital*, including land, forests, fossil fuels and minerals. In addition, natural capital also comprises those ecosystems that through their natural functioning and habitats provide important goods and services to the economy, or *ecological capital*. But the world economy today is squandering, rather than accumulating, key sources of wealth.

Despite rising natural resource scarcity and increasing environmental and ecological damage, the growth and structure of production in modern economies continues to use more resources and energy. We are not facing up to the rising economic and social costs of increasing natural resource use, pollution and ecological scarcity. We hide these costs by underpricing natural capital in our market, policy and investment decisions.<sup>17</sup> As a consequence, we are using up natural resources as fast as ever, increasingly polluting the environment and rapidly running down our endowment of ecological capital.

This raises two important questions:

- If natural and ecological capital are valuable sources of economic wealth, why are we squandering these assets?
- If ecological scarcity and natural capital loss are on the rise, why are we doing so little to address these problems?

The key to this paradox is the underpricing of nature in our economies: The increasing costs associated with many environmental problems – climate change, freshwater scarcity, declining ecosystem services and increasing energy insecurity – are not routinely reflected in markets. Nor have we developed adequate policies and institutions to provide other ways for the true costs of environmental degradation to be taken into account. This means that decision makers do not receive the correct price signals or incentives to adjust production and consumption activities. All too often, policy distortions and failures compound ecological

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scarcity, pollution and resource overexploitation by further encouraging wasteful use of natural resources and environmental degradation.

As David Pearce and I argued some years ago, this process has become a *vicious cycle* in today's economies:

Important environmental values are generally not reflected in markets, and despite much rhetoric to the contrary, are routinely ignored in policy decisions. Institutional failures, such as the lack of property rights, inefficient and corrupt governance, political instability and the absence of public authority or institutions, also compound this problem. The result is economic development that produces excessive environmental degradation and increasing ecological scarcity. As we have demonstrated, the economic and social costs associated with these impacts can be significant.<sup>18</sup>

This vicious cycle can also be depicted visually, as shown in Figure 1.2. Markets and policy decisions currently do not reflect the rising economic costs associated with exploiting the environment. The result is that economic development today produces much more environmental damage and ecosystem harm than it needs to. Such development leads to even more resource depletion, pollution, degradation of ecosystems and, ultimately, rising ecological scarcity. But the rising economic and social costs associated with these impacts and scarcity continue to be “underpriced” by markets and ignored by policies. The vicious cycle is perpetuated, and the current pattern of economic development persists.

Inadequate institutions and governance exacerbate this vicious cycle. Corruption, poor laws, lack of enforcement, inept public administration, insufficient regulation and political instability plague environmental management in many areas of the world; so does lobbying by powerful interest groups that gain considerably from the status quo. But perhaps the biggest challenge facing the world today is the lack of effective collective governance and agreements among nations as to how best to address the growing number of challenges and environmental risks that are occurring on a global scale – climate change, biodiversity loss, freshwater scarcity and the decline of oceans and seas.<sup>19</sup>

Rising environmental risks are one dimension of the problem. Another dimension is the increased societal risks. The vicious cycle also creates a structural imbalance in the economy, where the lack of green innovation and investments prevent the transition from a fossil



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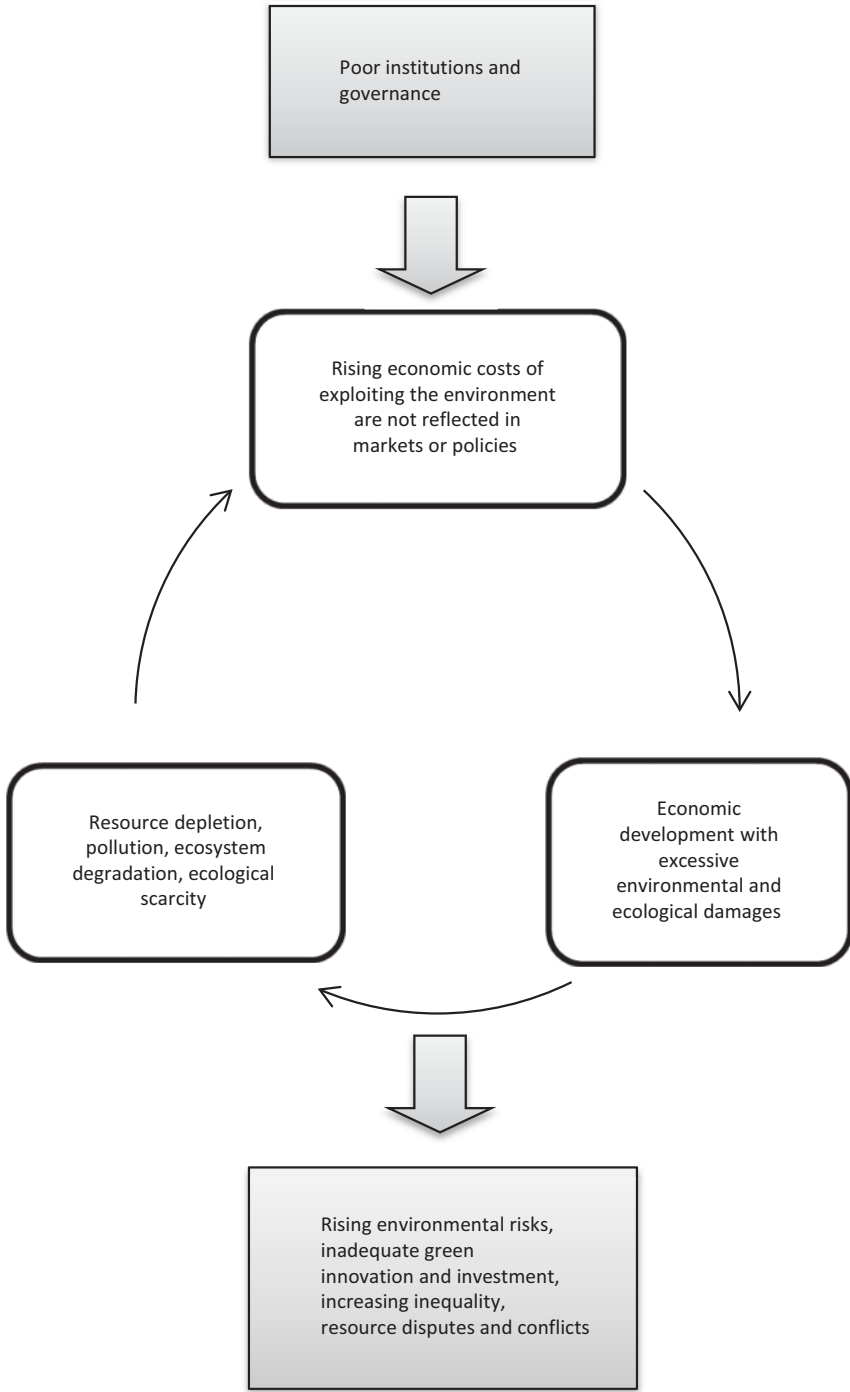


Figure 1.2 The vicious cycle of underpricing nature

fuel-based economy dependent on high rates of material and nonrenewable use to one that fosters cleaner energy sources and uses less resources. Degradation of the environment and ecosystems also impacts inequality, as it is the poorer and more vulnerable members of society that depend the most on nature and are affected the worst by pollution, climate change, natural disasters and other environmental risks. Ultimately, the rising environmental and societal risks could lead to greater conflicts over scarce environmental and natural resources. Already, there is concern about how climate change, disasters, water scarcity and other environmental threats are displacing large numbers of people, leading to enforced migration and exacerbating tensions and disputes among nations.

### Collective Action

As we shall see throughout this book, one of the key mechanisms for reducing environmental degradation and threats is *collective action*, which is joint action in the pursuit of a common goal.

The reason why collective action is required for reducing many environmental risks is that the resulting benefits are what economists call *public goods*.<sup>20</sup> The reduction in the environmental “bad” may benefit many individuals at once, and no individual’s gain comes at the expense of another.

For example, improvement in water quality through limiting pollution, removing sediment or controlling temperature extremes can have the characteristics of a public good. If I live by a lake that has had a reduction in pollution, any benefits I receive from the cleaner lake water do not lessen the benefits of others also living by the lake. All of us gain from a cleaner lake, and we enjoy these benefits simultaneously.

Realizing such an environmental improvement usually requires collective action. The members of a group who benefit need to act together to secure the outcome that has the most potential to benefit the group as a whole. The reason why this is necessary is because individual action will fall short of this outcome. Any single member who benefits has little incentive to deliver on the action that yields the most gain to all.

Take the example of cleaning up lake pollution. If I pay for the removal of pollution from the lake, then I will benefit from the resulting improvement in water quality. But so will others living by the lake. The difference is that they have no incentive to pay for the pollution