Review Essay: The Importance of Climate-Change Economics

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Anders Wijkman and Johan Rockström, *Bankrupting Nature: Denying our Planetary Boundaries*, tr. Jim Wine (2011; 2nd ed. London: Routledge, 2012), xiii + 206 pp.

William Nordhaus, *The Climate Casino: Risk, Uncertainty, and Economics for a Warming World* (New Haven: Yale University Press, 2013), xiii + 378 pp.

Michael Grubb, Jean-Charles Hourcade and Karsten Neuhoff, *Planetary Economics: Energy, Climate Change and the Three Domains of Sustainable Development* (London: Routledge, 2014), xxvii + 520 pp.

I.

What are your favorite indicators of the ecological predicament our civilization has produced? CO_2 emissions have now skyrocketed past 400 parts per million, well beyond the 350-part safety limit identified by climate scientist James Hansen ("Science"). One of those unpredictable and irreversible "tipping points" is now locked in to Earth's future, the melting of the West Antarctic ice sheet. That process alone could eventually raise sea levels by four to five meters (Elliott). This July, Siberian oil and gas workers discovered what might be the beginning of a new, ominous greenhouse-gas phenomenon, a methane hydrate eruption that blew out a sixty-five-meter crater (Phillips). Yet according to the 2014 Climate Change Performance Index (CCPI) rankings, not one of the top fifty-eight CO_2-emitting nations in this world "is doing enough to prevent dangerous climate change," not even Denmark (Burck, Marten, Bals 8). As one travels by train north from Madrid hundreds of wind turbines range across the landscape; renewables supply around 12% of Spain's energy. But because of substantial economic growth since 1990, Spain's use of fossil fuels has increased 43% (Giddens 82-83). That is the norm today: growth trumps decarbonization.

Timothy Clark's essay "Scale" addresses the present reality of global warming and related environmental challenges by reading a contemporary short story from the perspective of a 600-year time scale, 300 years before and 300 after its contemporary setting. The exercise leads Clark to conclude that "the humanities as currently constituted make up forms of ideological containment that now need to change" (164). That is, literature professors like me tend to be more comfortable dealing with what Clark calls "cultural representations" than with "the environmental costs of an infrastructure" such as Clark's long-time-scale perspective on his chosen story requires. (The "infrastructure" in that case consists of many internal-combustion cars and several

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houses widely separated that a single cash-strapped family struggles to maintain). For Clark global warming and related environmental challenges demand a re-thinking of humanistic study.

Addressing that demand could actually re-shape not only many a university curriculum but entire educational systems. And it could also provide valuable perspectives on the concerns of those more attuned to number, weight, and measure. For Clark's call also underscores that the economics of climate change, for instance, are too important to be left to economists. The study of costs and infrastructures, valuable in itself, also needs more contextualizing in the realm of cultural representations. For one thing, beyond the current failures are more destructive ones not yet inevitable.

The economics of global warming and related environmental problems focus on two main areas, mitigation and adaptation. How can the provisioning of technology, goods, and services in societies be modified to *mitigate* the problems, and how can modification help societies and ecologies *adapt* to unavoidable changes? Economic proposals for alleviating global warming have now become especially problematic because warming's destructive effects have so relentlessly overwhelmed preventative steps, and economics is crucial to such steps. Science has learned a great deal about the scope of climate change, promising that technologies are being developed to address it, but more often than not it is economic calculations, proposals, decisions, and agreements that determine how individuals, businesses, and governments act on these insights. Even though climate economics has arguably contributed to a larger "failure of our systems of decision-making" (Jamieson 237), it will remain crucial. And a question that has emerged strongly for me is at once political and economic: the degree to which the twin goals targeted by the UNFCCC in 1992, which remain those of the great majority of economists and have been repeatedly re-affirmed by the U.N., are really compatible: successful climate-change mitigation along with preservation of the economic growth of global capitalism.[1] I have grown skeptical about that.

If, as a growing number of scholars suggest, global warming and related environmental issues must become a basic concern of environmental and humanistic studies (*Symploke*), researchers in these fields should therefore also acquire at least some familiarity with the perspectives that professional economists have taken on these issues. The purpose of this review essay is to take a few steps in that direction. I have chosen three books selected according to the following criteria: recent publication (2012 or later), prominence of the authors in their fields, substantial or total focus on climate and energy economics, diversity of viewpoints, and availability in English.

Perhaps unsurprisingly, such a selection is skewed to Western and, to a lesser degree, mainstream-economic perspectives. "Mainstream" here means holding to the view that economic value created by humans can be sustainably substituted for natural "capital" (natural resources including potentially the entire biosphere), and that therefore economic growth can proceed indefinitely despite depletion of natural

[1] Stuart Rosewarme, James Goodman, and Rebecca Pearse (7-9) outline a good case that the 1992 UNFCCC's paired but potentially incompatible goals have licensed the compromise of the science-based first goal in favor of the second, for instance in the 2007 IPCC report and the 2006 Stern Review.

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resources. And all the authors, even those who call for a steady-state rather than a growth economy, address and are part of established academic and governmental institutions. Further, some of the ways that one or more of the authors talk about tackling global warming seem to recall or at least accommodate anthropocentric, exploitative, or neo-colonial attitudes that historically have helped bring on this crisis. In all cases, what might be called the market-and-data orientation of economics can render problematic the crucial valuation of all that is outside the market. But these books reveal a good deal of the current state of a field with potentially enormous impact, and they offer ingenious, intriguing, and stimulating ideas about the present and future. Though the authors are all realists in a topsy-turvy realm where realism itself may well be utopian, their books express influential viewpoints that have and will shape discussion and policy in real places. Such studies constitute an important genre of discourse the form as well as content of which should fall under the purview of rhetorical and literary scholars. The genre of inclusive climate-economics proposals has a utopian dimension insofar as it requires imagining a future world, or parts of one, based on reference to the world as it is.[2]

I consider the three books here in the order of publication. That is convenient because the earliest, with the greatest disciplinary breadth and most heterodox economic orientation, contextualizes the subject and its critical issues best, and because the latest is a veritable *summa economicarum climatum* that offers a partial synthesis.

II.

Bankrupting Nature: Denying Our Planetary Boundaries (2011; 2nd ed. 2012), is co-authored by Anders Wijkman, a long-time Swedish representative in the European Parliament and former Secretary-General of the Red Cross, and by Johan Rockström, a Swedish climate scientist who led a distinguished international team in a landmark 2009 project identifying nine environmental "planetary boundaries." The book is packed with ideas and with evidence, information, and documentation across scientific, technological, and economic fields. It is an excellent bibliographical source. The authors are familiar with every official report of significance related to global warming, especially European and U.N. ones. They explain that significance clearly enough for non-specialists (despite sometimes skipping from point to point and back), though their primary audience seems to be scientists, economists, politicians, bureaucrats, and business leaders.

Bankrupting Nature is wide-ranging and somewhat loosely organized, with four substantial chapters devoted to economics and a good deal of economically relevant content elsewhere. Two chapters concern climate negotiations at national, European, and worldwide levels, with which both authors have first-hand experience. With frustration and exasperation they speak of politicians and negotiators watering down scientific benchmarks and of disastrous international negotiations from Copenhagen to

[2] A list of best economic practices would supply content criteria useful in a formulation of this genre. See Ackerman and Stanton (4, 129-133).

Doha ("more like trench warfare than a search for common solutions" [172]). Sometimes they speak with dogged resolve: Rockström will speak truth to power even with "a fool's stubbornness" (21). Why is progress so difficult? Politicians fear negative reactions from the stock market much more than from the people. The book then is an opportunity for the authors to think beyond current political constraints.

The chapter on the nine planetary boundaries is outstanding, contextualizing the threat of climate instability among the others. Three of the nine have already been breached: climate (of course!), biodiversity (species extinction), and the nitrogen cycle (through use of fertilizers). Other chapters of widely varying lengths and concerns focus on population growth, agriculture, the greenhouse effect, arguments against deniers, the dwindling arctic ice sheet, and skewering an official claim that Sweden is the greenest of nations. There is a chapter outlining seven basic attitudes about climate change that distinguish the authors' holistic "Earth Systems Science" approach from that of "the IPCC mainstream" (91).

The chapter on agriculture is among the most significant. It focuses mostly on the developing world. The authors identify two concerns relating to a rising world population that will peak in midcentury: decarbonizing agriculture and addressing the tremendous challenge the growing numbers of poor face due to global warming and related environmental issues. Agricultural experts in both developed and developing countries must undertake a tremendous task. The contradictions are stark and staggering. For instance, agriculture currently accounts for one-third of all CO_2 emissions, and yet a 70% increase in food production will be needed by 2050; the developing world needs a lot more fertilizer, but fertilizers in their present form have already breached a planetary boundary; a tremendous amount of water is required, but due to melting glaciers and other factors, considerably less water will be available. Yet the authors conclude that with a great deal of research, dedication, and management, resolutions to all these problems are just barely possible, barring climate surprises.

Disappointingly for our purposes, however, the authors do not venture to address the specifically economic dimension of this topic—how much it will all cost and who will pay. But with this chapter, *Bankrupting Nature* gives more specific attention to nature and to the scope of the problems the developing world is facing than the two other books reviewed here. Still, the chapter does not have much to say about the agency of the people in developing nations as collaborators or leaders, for instance in adapting traditional, currently sustainable farming practices to the more challenging conditions. Its proposals have a top-down feel. Surely, the authors do not mean to impose a series of directives hatched in the Global North on peasants and indigenous peoples, and thus to further entrench the latter's powerlessness at the hands of corporations or authoritarian political structures (see Shiva, Martinez-Alier). Both here and elsewhere the book tends to throw out attractive ideas but stops short of confronting the controversial issues of their practical application, issues that often have to do with the authors' challenge to mainstream economics and the expansive globalization it underwrites (to which challenge we shall turn now). As reviewer Helen Kopnina puts it, it is lamentable that this "is not an even stronger and bolder book than it is" (85).

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The economic portion of the book brings together many principles, critiques, and policy ideas advocated by a range of economists, often alternative ones, and by specialists in related disciplines. The aim is to "initiate a broad discussion among leading economists" (135) at a time when the need is for no less than "a revolution, both in attitudes and social and economic organization," so as to inaugurate a "radically changed perspective on both the use and allocation of resources on Earth" (175).

Bankrupting Nature draws heavily from ecological economics. It challenges the mainstream economic axiom that the realm of human economic activity is separate from the natural environment from which that realm draws resources: on the contrary, the human economy is just part of the entire ecosphere. That is clearly an economic principle with promising non-anthropocentric implications. The book also sets climate change firmly in the larger framework of related environmental and economic challenges and solutions. The authors thereby express the holistic orientation of their book's sponsor, the Club of Rome. And they also pursue another signature tenet of that organization, as well as of ecological economics (Daly) and the so-called new economics (Boyle and Simms), one expressed in the title of the Club of Rome's most famous book, Dennis and Donella Meadows' millions-selling *The Limits to Growth* (1972; updated 2004). Society needs "a broad discussion" about the dilemmas of growth (158), for we are vastly "overshooting" and polluting Earth's resources faster than it can replenish them or clean them up: "the economy is growing but the planet is shrinking" (125). Whereas the mainstream economists I have encountered never justify in any detail their assumption that economic growth in its present form should and will continue indefinitely, Wijkman and Rockström provide a great deal of evidence why it shouldn't and can't.

For our authors, a big part of the problem is disciplinary: conventional economists don't know "how nature works" (136) and haven't noticed "the rapid erosion of the resource base" (125), and yet "the death of several billion people by starvation" is at stake (129). Their indictment of today's global economy and the economists who legitimize it also points to the economy's financial busts, unstable energy prices, poor job creation, its long-term trend of increasing income inequality, and the well-established disjunction between material wealth and genuine "wellbeing" (129, *passim*). But now, it seems, many economists and organizations are, to one degree or another, "rethinking economics" (124).

For a host of reasons the standard measure of per capita wealth and of economic growth, GDP (Gross Domestic Product), would be replaced by measures of wellbeing as indicators of a nation's economic strength, such as those having to do with jobs, health, education, income distribution, and ecological balance. Possessing and preserving valuable natural resources does not count toward GDP figures, nor do pollution and the depletion of resources lower them. The substantial overshoot in resource use taking place now makes this failure of GDP to account for environmental assets and liabilities particularly dangerous.

The reform most emphasized in climate economics is of course precisely accounting for negative market "externalities" obscured by GDP and by market prices.

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Although the conventional economic model is a free market one, it institutionalizes "market failure" at the most important level, because the externalities or negative environmental effects of fossil fuel use are generally not included in their misleadingly low prices. Their real social costs are hidden, giving them an undeserved advantage over renewables and inviting the full cargo of climate-change plagues. Either a tax or a cap-and-trade system provides the means of extracting a "social price" for carbon emissions, that is, a price that will effectively drive producers and consumers to alternative fuels and to more efficient use. In cap-and-trade markets, producers buy and sell the right to extract or to pollute up to a certain limit. The authors suggest setting an initial price for a worldwide carbon market of €40 per ton of emissions, a price that would be raised periodically. (The book was published before the collapse of the European greenhouse-gas cap-and-trade system).

But from this holistic point of view, raising the cost of carbon is just the beginning of proposals that would go beyond the notion of externality itself. Values should be determined for "natural capital," meaning natural resources viewed as economic assets, and "ecosystem services," the beneficial tasks the natural world performs (as if) for us, such as "purification of air and water, decomposition of wastes and residues, creation of new resources, pollination of plants, the regulation of both climate and water cycle," (132), and so on, values not usually included in cost-benefit analysis. This means recognizing that the economy is part of the natural world, not "external" to it, and forcing realization that the value of lost natural capital often exceeds the benefits of destruction.

This looks like a crucial reform, but pricing natural capital in monetary terms also introduces an unaddressed danger. When the alter-globalization World Social Forum denounces the "green economy" as a means for "capital […] to launch a new cycle of expansion [...] [and] to integrate parts of nature into the financial gearbox" (*Another Future is Possible* 17), it is pointing out that the pricing of natural capital can just as well be seen as a way of putting nature into the economy instead of the opposite. It has provided an opportunity—even under U.N. auspices—to incorporate natural resources into speculative financial and real estate markets, to the great detriment of displaced peasants and indigenes, and for little or no good to the environment.[3]

Regulating the financial system could make it an important contributor to a green economy. A fundamental problem concerns the way money is created in our economy: through bank loans in a process resembling a "pyramid scheme" (139) that stimulates uneconomic growth and therefore pollution, resource depletion, and global warming. Curbs on bank loans and other reforms could suppress that. Another related economic culprit is "short-termism." As the two books below discuss at greater length, investment in environmentally sustainable projects such as renewable-energy technology and

[3] Through the U.N.'s REDD+ program, the so-called green economy aims "to set a price for every one of nature's goods, processes and so-called 'services.' Once everything has a price tag, new bonds could be issued and negotiated in the international financial marketplace […] [leading] to the destruction of indigenous and rural-community lifestyles and is de facto expropriation of their territories" (World Social Forum 7). See also Anonymous, "REDD."

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infrastructure require a long-term commitment, and financial short-termism has diverted banks from a basic investment responsibility.

The authors join the call, which has since become louder (voiced recently by Robert Rubin, former U. S. Treasury Secretary) for responsible financial valuation of fossil fuel companies and of the risks of investing in them. According to climate scientists, most of the remaining fossil fuel reserves must stay in the ground, meaning that the corporate owners of those reserves may be worth considerably less than their stocks are priced. So let political leaders speak out and financial analysts do proper risk assessments; the stocks will plummet and investments will go elsewhere, including to promising renewables. It is important for economists to engage a non-specialist audience so as to encourage investor activism and preferential investment in green companies.

Finally, the most well-developed reform broached in the book concerns the "circular economy" as developed by a number of researchers and addressed in a 2012 McArthur Foundation report endorsed by several multinational corporations.[4] Such a reform could contribute to a steady-state economy with continued innovation and economic development, along with more efficient resource use and less emissions. The present, mostly "linear" economy is "take-make-dispose": extract raw materials, manufacture the product, and dispose of it at end of life (163). The linear economy maximizes resource use and waste production, threatening planetary boundaries.

In the circular economy, products are "designed for ease of reuse, disassembly and refurbishment" (165-166), and at end of life their metals, plastics, rare earths, and other materials are reclaimed in vastly expanded recycling industries. The goal is *biomimicry*, a biocentric model that imitates the waste-free web of life. Modeling technology and the economy on ecological processes is a classic green ideal, and the authors return to it later in the context of product design or "biomemetics" (178) and of technology (Benyus; Benyus and Pauli). This business model is centered on services rather than products. This means renting or leasing rather than buying products, which would be long-lasting and upgradeable. Tax reform facilitates transition to the circular economy: just as Sweden lowered income taxes when it imposed a carbon tax, in the circular economy taxes on labor would be reduced in exchange for taxes on use of "virgin materials" as well as on carbon. To "dematerialize the economy" (169) would also require regulations progressively increasing efficiency targets.

The concluding chapters address prospects. Given the sorry track record so far, the world might get down to business only after "large and serious crises" (173)—a possibility others associated with the Club of Rome have addressed in fascinating detail (e.g. Gilding), and which may start to unfold before our eyes. To forestall such an outcome, the authors suggest particular areas where individual nations could agree to move forward. The final chapter offers guidelines for generating climate-mitigation measures.

[4] For instance Walter Stahel, *The Performance Economy*, 2010; Michael Braungart and William McDonough, *Cradle to Cradle: Remaking the Way We Make Things*, 2002; McArthur Foundation, *Towards a Circular Economy*, 2012.

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Bankrupting Nature is at its best when combining that holistic approach to solutions for climate change with an appreciation of natural systems as wise models of efficiency. But for all that, what is at stake here remains only *human* well-being. The book does not accord value to the natural world in itself. The affective spectrum emphasizes anguished concern for the equipment our species requires. In that respect this book is like the other two reviewed below: the environment is perceived and discussed in instrumental terms. Can anthropocentric climate science win over the anthropocentrism intrinsic to global warming? And though the conclusion affirms the importance of "bottom-up solutions" (184) the emphasis has been on top-down ones. That kind of emphasis must be an occupational hazard of writing books to set the world right, but for changes this broad and deep a great deal of activist popular support would be necessary. Yet the authors speak to their peers; the book is neither written nor priced to grab wide attention. As mentioned above, the authors seem to have made a strategic decision not to confront controversial issues entailed by their stance on the limits of economic growth. That is apparently because they hold out a perhaps utopian hope that the political, intellectual, and corporate establishment of consumer capitalism can transform *itself* into a benevolent promoter of green well-being in a steady-state economy.

III.

William Nordhaus's *The Climate Casino*: *Risk, Uncertainty, and Economics for a Warming World* (2103) is a very different kind of book. First of all, while the author demonstrates an impressive knowledge of science, he is a fairly militant mainstream economist who displays almost complete ignorance of (or lack of interest in) the implications of the Earth Systems Science that is central to *Bankrupting Nature*. Nordhaus focuses laser-like on global warming as a problem distinct from others, takes for granted that growth will continue, and seems to view environmental damage as a matter of local dysfunctions. Second, the purpose of *The Climate Casino* is not to suggest a range of intriguing ideas but to develop, step-by-step, a single economic "focal policy" (76), one easy to grasp in its outlines yet with the depth and substance to withstand attack and pass muster in legislatures and international summits. So the only utopia here is the world of conventional economics (which is sometimes confused with reality).

The Climate Casino is elegantly written and organized. Professor Nordhaus addresses both specialists and ordinary readers, often providing masterful summaries of technical findings. His book's dozens of figures and tables can be challenging, but they empower the reader both to understand and to evaluate the argument as it unfolds, and to appreciate how climate scientists and economists work. There is also an enhanced online version of the book with interactive materials. Yet at several key points, I did stand in need of additional clarification such as a student in a classroom would request the teacher to supply. The book presents a rhetorical pattern pairing the generation of precise calculations with qualifications regarding their unreliability. That pattern is fundamental to the strengths and limitations of the book.

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In Parts I-IV, Nordhaus leads the reader systematically from soup to nuts, from the science of global warming to the impacts warming has and will have on the earth and society, to strategies for mitigating and adapting to it, and to a specific set of recommended economic policies. The "focal policy" is actually outlined in the first chapter: the cost of the climate fix will be one-to-two percent of world income a year, and the policy will center on putting a price on emissions of CO_2 and other greenhouse gases, one that rises regularly. Public awareness of what is at stake, along with accelerated technological research, are the other pillars of this policy.

The fifth and last part of the book, "Climate Politics," addresses not only climate-change deniers, as the above-reviewed book does, but also public opinion and a range of other obstacles to establishing climate-change policies, all with the help of plentiful research and careful thought. It includes a patient, knowing, and direct appeal to what Nordhaus (donning his "conservative cap" [312]) may have chosen to be his primary group of readers throughout, U. S. conservatives of the Republican party—at least ones with open minds and good sense. It would be crucially important to persuade them that climate change is both real and manageable if the U. S. were to approach even the E.U.'s current degree of legislative commitment.

Nordhaus has long been a key figure in climate economics. The book comes with impressive blurbs (including one from President Obama's former chief economic advisor) and a long Acknowledgment that includes dozens of eminent economists. It is no doubt being read at the highest bureaucratic and political levels in the U. S. At Yale University, Nordhaus led the development of the widely used family of DICE models (Dynamic Integrated Models of Climate and the Economy) for estimating economic impacts of global warming with mathematical specificity—used cautiously because, at least at the present stage of climate research, there is too much that cannot be predicted with the necessary degree of accuracy.

Nordhaus is well aware of the limitations of climate-change economic modeling, including its tendency to underestimate damages under certain conditions (see also "Free Exchange: Hot Air"). For instance, he explains why it is hard to predict "tipping points," where systems start an irreversible collapse. Sure enough, as also mentioned above, since publication of the book a major tipping point has been passed, making collapse of the West Antarctic Ice Sheet inevitable, though not imminent. If the book had come out a year later, predictions of sea-level rise during the sheet's post-tip decline could have been included in DICE inputs. And as *The Climate Casino*'s title itself suggest, uncertainty is actually as much the book's running theme as determining specific figures on, for instance, the economically optimal planetary temperature increase or the wisest initial rate of a carbon tax or cost-benefit ratio. The rhetorical effect is to suggest that, despite the best-laid calculations, things here on Earth could turn on us dreadfully, so we'd better just "turn around and walk back out" of the Climate Casino (4).

Yet at the same time *The Climate Casino*'s number crunching does often seem by comparison, as reviewer Paul Krugman points out, to downplay somewhat the climate threats and the required mitigation efforts. (And in a forthcoming article, two leading British economists claim that the DICE model significantly underestimates warming's

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impact on an economy's productive capacity [Spross]). So should one focus on the math or on the imponderables? If the former, perhaps the idea is to reassure conservative readers that embracing moderate mitigation efforts entails neither a betrayal of their political credo nor a reduction of their living standards. But such a stance can easily lapse into smugness. For instance, one of Nordhaus's bedrock assumptions (shared by many mainstream economists) is that people will be a good deal richer in the future, because economies will continue to grow, and when it comes to climate disruptions they will also have learned how to adapt, so—who knows?—they might not mind much when sea levels rise quite a bit! Because of its paradoxical combination of mathematical specificity and unsettling uncertainty, the book seems to cue divergent responses with regard to the ease with which we can leave the climate casino.

Let's follow our climate economist part way on this book's journey to identify what conditions might be like in the future, how they will affect the economy, and what policies might be adopted in response. This journey includes constant discussion of issues posed by state-of-the-art research. Nordhaus starts by considering how much the planet will warm by a given future date. To that end, we must estimate levels of CO_2 and other greenhouse gas emissions (such as methane from natural gas and thawing permafrost). The three crucial factors determining emissions worldwide will be population growth, the degree to which mitigation efforts reduce "carbon density" in energy production, and living standards as represented by GDP per capita. We plug that data into a computer modeling system which predicts how the level of warming at our specified date will affect Earth's natural systems and features, such as sea level, ocean acidity, hurricane intensity, and so on, always with the qualification that we cannot predict aspects like tipping points and the power of feedback loops (when one warming trend sets off another and the two reinforce each other). Now we can go on to consider the "Impacts of Climate Change on Humans and Other Living Systems," the title of Part II of the book. With the help of DICE or similar modeling systems, which Nordhaus also takes into account, we generate a figure for the economic damage done by a given rise in Earth's temperature. In tallying the damage, Nordhaus considers are diverse areas such as farming and food, human health, engulfed coastal settlements, and the "loss of unique heritage sites" (112). An important finding from examining the data is that in all areas, the resilience of the developed world's better managed productions systems should provide comparative insulation against the worst effects of global warming. However, there turns out to be a major problem with trying to assign monetary value to the environment: in this case what look like the most valuable areas are the ones "far removed from the market and thus from human management," including "human and natural treasures, ecosystems, ocean acidification, and species" (136). It seems that "[e]conomics can contribute the least in areas where we need it most" (136).

Here emerges a great gulf between different economic approaches to valuation of the environment. Nordhaus discusses the difficulty of valuing coral reefs, for instance. He sensibly rejects one mainstream-economic method: polling people about how much they would pay to save, say, Australia's Great Barrier Reef. But coral reefs have tremendous economic value: flood protection, fish habitat, and so on. Ecological

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economists estimate that value when assessing kinds of natural capital and ecosystem services. Ocean acidification from absorption of excess atmospheric CO_2 has been eating away at coral reefs for some time, and the lost value of coral reefs to human beings since 1997 as measured by a prominent such economist, Robert Costanza, is well into the tens of trillions of dollars (Zimmer). Nordhaus ends up without any way to value those "most valuable areas" outside of the market, once again emphasizing how uncertain his precise figures are.

His duly qualified estimate of damages focuses in this case on the U. S. economy: with a 2.5C° temperature rise since the year 1900, by 2070 the damage across areas that can be quantified would amount to 1.5% of annual GDP (139). That seems to be staggeringly below what an ecological economist's estimate would be, because that estimate would be based on a way of roughly determining a price for many of the non-market areas that Nordhaus excludes from his calculations. The difference in approach is that ecological economists are convinced that human capital cannot replace natural capital beyond a certain point, and that therefore the biosphere and Earth's non-living treasures are more valuable to humans than mainstream economists believe they are. Nordhaus does emphasize the dangerous uncertainty stemming from his view of the unquantifiability of non-market areas, and he indicates that a risk premium needs to be added to his 1.5% estimate of damages. But since there is no agreement among climate economists about the size of the premium, none gets added.

Part III considers step-by-step whether we should aim for the 2 C° limit agreed to at the 2009 Copenhagen summit, or for a different figure. The answer hinges on a cost-benefit analysis, which finds that it would be better to do a certain amount of near-term "economizing" (146) on climate-change expenses now so we can leave more of the cost to those rich, weathered, and adaptation-savvy descendants of ours—although doing so will also bequeath them a temperature rise of 2.3° C.

At this point of the argument, three questions must be asked: why does the author not take more seriously the value of Earth's natural bounty (in the form of "natural capital" or "ecosystem services")? Is it reasonable, given ecological overshoot, to expect both continuing economic growth and rising living standards far into the future? And whose growth and living standards is at stake? The benefits of economic growth have notoriously accrued to a wealthy minority, while the majority of the Earth's population is falling behind, a trend predicted to continue and to increase in future generations (Picketty). Over two billion of us live on the edge, with a billion living near starvation and with dim prospects. The latest IPCC report summary concludes that "climate-related hazards" are very likely to produce "negative outcomes for livelihoods, especially for people living in poverty" (IPCC 7). Are the rich heirs of today's 1% to be the golden ones who will set things right? Does mainstream economics exist in world in which no explanations of basic assumptions are needed, even when the subject is one of survival?

However, it turns out that limiting temperature rise to 2.3° C under the focal policy is only the best-case scenario, requiring full and maximally efficient participation by all nations starting more or less immediately. Given the slight chance of that, even

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with sanctions, continuing to strain for that limit would cause "a horrible economic depression" (180). But must we really accept the view that our only choice is between economic growth and economic ruin? Nordhaus prioritizes growth of the existing economic system over climate mitigation. But what if the limits-to-growth party is right? What if, as Naomi Klein has recently observed, "Our economic model is at war with life on Earth" (Klein)?

Parts III and IV offer an education in cost-benefit analysis and discounting under different assumptions and in different segments of the economy, including households. There are surveys of different mitigation technologies, and assessments of their usefulness and costs. The shrewd and wide-ranging discussion of the two leading carbon-pricing methods, taxation vs. cap-and-trade, is indispensable, and the caveats about depending on government regulations are eye-opening. The work-up predicting U. S. energy production in 2050 based on Obama's by-no-means radical goals is surprising and somewhat disturbing: even with very high carbon prices, coal and gas would still provide for half of the country's energy needs, though that would depend entirely on successful development of carbon sequestration technology—which may turn out to be unfeasible. High prices give solar a modest future, though wind could capture a quarter of the market. Our future depends on low-carbon technological innovation spurred not only by high carbon prices but by private and government support that can intervene in the so-called technological "valley of death," where breakthroughs failing to get prompt investment funds gradually lose exclusivity and no longer remain attractive to developers.

The Climate Casino remains a stellar contribution that increases public awareness of global warming and further commitment to mitigation in the U. S., not least because it is able to present state-of-the-art science and economics to ordinary readers who are prepared for a challenge. Yet despite bits of ethical and aesthetic lip service, the book constitutes a *de facto* affirmation of the ultimate value of human capital, and projects a disturbing sense of human omnipotence over nature and its value. The book's focus on the quantifiability of capital also throws the emphasis off more relatable and rending losses such as species extinction, forest fires, disease, rising sea levels, dangerous weather, and so on. Given the stakes, Nordhaus' failure to justify his assumptions or to consider alternatives is unacceptable.

IV.

Published less than a year after *The Climate Casino*, *Planetary Economics* depicts a very different situation, one in which confidence in economic calculations has shrunk, whether concerning damages, temperature targets, costs, or mitigation benefits. If Nordhaus sent Calculation and Uncertainty on a game of hide-and-seek, Uncertainty has decisively won here. If one expert sets the social costs of CO_2 emissions at $10 per ton, another at $1000, such calculations must be pointless. The part of the future we can predict is dwarfed by the parts we cannot. Climate economics is really about security, not optimizing costs and benefits.

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The three authors of *Planetary Economics* are distinguished academics in the U. K., France, and Germany, respectively, with experience administering or advising national and international organizations on global warming. Two are climate economists; the principal author, Michael Grubb, edits the journal *Climate Policy*. The book comes with glowing endorsements from eight other prominent European and U. S. academics. It is a hefty volume in rather small type, long in the making, meticulously documented, and written at a fairly high level of technical sophistication primarily for those in research or in government, though with equations confined to an appendix. But it provides summaries and substantial overview, introductory, and concluding chapters that make it possible for the dedicated layperson to comprehend its leading ideas.

I will not presume actually to evaluate the book in any detail; to my knowledge, neither has anyone else (but see Barrett). However, the book does convincingly purport to redefine the field of economics, specifically to make it effective at last in spearheading climate policies and programs. And it exhibits awesome practical knowledge of the business landscapes of relevant industries. It also offers specific advice on how to move forward, based on the book's thesis that there are three different economic disciplines representing three aspects of climate policy, aspects that support one another and must be pursued together.

The book implies that the present operating system of the world economy has failed and is leading to ruin: though its stupendous output has transgressed several of Rockström's planetary boundaries, 2.5 billion people "still live in grinding poverty" (1). Here failure is measured against a standard that departs significantly from the "sustainable growth" mantra installed by the UNFCCC in 1992: the proper goal "should be to improve human welfare without exacerbating local or regional environmental damage or risking 'dangerous anthropogenic interference' with the climate system" (12). The goal of welfare has replaced the supposed means to it, growth—though the authors are too canny to leave it just at that (see below). Why has progress toward putting the world on a path to 2° C been so "glacial" (46) even though our economy, as the Appendix argues, has a "large capacity to adapt to a wide range of possible future requirements and constraints" (19)? Part of the answer is that economists (including one William Nordhaus) have been focusing too much on markets and pricing, and on furthering neo-liberal globalization. Markets constitute only one of the three relevant "domains" of economics that need to be co-coordinated to get on the right path to sustainable development.

The fields of behavioral and organizational economics comprise the first contributing domain. The goal is to make consumption of energy more efficient by facilitating "better choices" (68), fostering changes in people's attitudes and habits relating to energy use and climate change. Among the means here are regulations requiring insulation as well as energy-related information and production standards covering product efficiency. The fields of neoclassical and welfare economics comprise the second domain. The goal here is to use the power of the market, pricing, and investment in alternative energy sources to shift the economy toward clean energy consumption for the "collective good" (57). The fields of evolutionary and institutional

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economics comprise the third domain. These fields concern long-term trends of economic development in different regions and the roles of institutions and governments. The major goal here is strategic investment through public or other funding to "support the evolution of more efficient and lower-carbon energy systems" (68). The book devotes three substantial chapters to each of these domains.

Energy systems must be coordinated across the three domains through three "pillars" of policy. For instance, pillar-one savings in energy bills help support the payment of pillar-two taxes or cap-and-trade prices for carbon emissions, which in turn encourage more efficiency; pillar-three advanced electrical grids delivering cheaper energy do the same, and their high cost is offset by their long-term benefits. The post-mortems concerning unsuccessful carbon-pricing proposals in different nations, along with pragmatic recommendations about how to achieve success, are especially impressive here. The key to successful reform is to do it in small, patient steps, with co-ordination across pillars, with deep knowledge of relevant economic and political conditions, and with democratic input.

Perhaps the majority of the broad-ranging economic proposals of *Bankrupting Nature* could be classified in the first or third pillars of this new view of economics. And *The Climate Casino*'s three-part program fits, too: public awareness is mostly first-pillar, the focal policy of carbon pricing second-pillar, and funding for innovation and discussion of the technological valley of death third-pillar. What *Planetary Economics* emphasizes is the need to align reciprocal benefits across the pillars, exploring and developing the resources of the first and third, and keeping second-pillar matters from dominating.

The book's most theoretically incisive point concerns the contributions of the first and third domains to economic growth, which depends largely on innovation, which in turn must supply crucial climate-mitigating breakthroughs. But economic theory has so far only been able to explain half of the observed quantity of innovation. The authors argue that the unexplained "dark matter" of economic growth must be sought in aspects of the first and especially third domains, for instance "regulation, institutional and technical change, education and infrastructure" (404), as well as research institutions and corporate investments, along with cultural factors.

Further, since many measures to address climate change fall into these categories, perhaps climate change need not comprise primarily an additional set of costs that drag down the economy but a catalyst for beneficial economic transformations—as motivator, stabilizer, and coordinator. Despite their book's title, the authors show little interest in international agreements, but with climate change as an economic catalyst nations would want to join the cutting-edge "transformers' club" in order to "to reap the rewards of low-carbon investment and innovation" (485) even without comprehensive international agreements. Climate change could even facilitate Europe's moribund economic recovery: due to low interest rates, there is much underutilized capital on the one hand, and on the other the "real economy is desperate for investment" (480), so renewables should present a welcome opportunity. Here the selling point for investment in mitigation technology is no longer the usual one, i.e. that

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growth will be preserved along with climate mitigation, but simply that the demands of mitigation might stimulate growth in sectors where growth will be truly sustainable.

In addressing a "failure of theory" in economics (2), *Planetary Economics* gestures toward more enduring principles of civilization existing prior to the development of that field in its classical form. Political economy, the authors point out, quoting the *OED*, is the "'art of managing the resources of a people and its government,'" and civilization involves "development of a social capacity to pursue the common good" (485-486). Possibly, the program outlined here would lead over time to deep economic and social changes ushering in a welfare-first, socialistic economic environment, though the book's thrust is more toward coordinating elements than replacing them. In his *Elements of the Philosophy of Right*, Hegel observes that the owl of Minerva flies at dusk—philosophical understanding matures in an age of decline when action becomes feeble. One hopes this phrase does not turn out to be applicable to this book, Hegelian in its breadth, scope, and boldness of conception. The 2° C goal may have been a dream, but possibly *Planetary Economics*' broad synthesis could still contribute to making climate mitigation and adaptation the creative and organizing center for economies worldwide, as well as an important part of education in cultural and environmental studies.

Works Cited

Ackerman, Frank, and Elizabeth A. Stanton. *Climate Economics: The State of the Art*. London: Routledge, 2013. Print.

Anonymous. *Another Future is Possible. World Social Forum*. Rio+20 Feb. 2012. Web. 1 Aug. 2014 <http://rio20.net/wp-content/uploads/2012/02/Another-Future-is-Possible_english_web.pdf>.

Anonymous. "REDD." *Issues.* Carbon Trade Watch. N.d. Web. 2 Aug. 2014.

Barrett, Scott. "Climate Economics: A Strained Relationship" (review of *Planetary Economics*). *Nature* 508 (2014): 179-180. Web.

Boyle, David, and Andrew Simms. *The New Economics: A Bigger Picture*. Sterling, VA: Earthscan, 2009. Print.

Burck, Jan, Franziska Marten, and Christoph Bals. *The Climate Change Performance Index: Results 2014*. *Germanwatch*. Germanwatch and Climate Action Network. 18 Nov. 2013. Web. 22 June 2014.

Clark, Timothy. "Scale." *Telemorphosis: Theory in the Age of Climate Change*. Ed. Tom Cohen. Ann Arbor: Open Humanities Press, 2012. Print.

Daly, Herman. *Beyond Growth: The Economics of Sustainable Development*. Boston: Beacon, 1997. Print.

Elliott, Briana. "West Antarctic Ice Sheet Collapse Calls for Revised Sea Level Rise Predictions." *The Beacon.* Oceana's Blog. 24 June 2014. Web. 21 July 2014.

"Free Exchange: Hot Air," *The Economist*. 5 Oct. 2013: 78. Print.

Giddens, Anthony. *The Politics of Climate Change*. 2nd ed. Cambridge: Polity Press, 2011. Print.

Gilding, Paul. *The Great Disruption: Why the Climate Crisis Will Bring On the End of Shopping and the Birth of a New World.* New York: Bloomsbury, 2011. Print.

Jamieson, Dale. *Reason in a Dark time: Why the Struggle Against Climate Change Failed—and What it Means for our Future*. Oxford: Oxford University Press, 2014. Print.

Intergovernmental Panel on Climate Change. "Summary for Policy Makers." *Fifth Assessment Report. IPCC*. WHO UNEP. 31 March 2014. Web. 3 July 2014.

Klein, Naomi. "This Changes Everything: Capitalism vs. the Climate-Book Trailer." *Vimeo*. 3 Aug. 2014. Web. 17 Aug. 2014.

Kopnina, Helen. "Book Review: *Bankrupting Nature….*" *The Trumpeter* 29.1 (2013): 78-85. Web.

Krugman, Paul. "Gambling with Civilization." *New York Review of Books* 60.17 (2013). Web. 4 Jan. 2014.

Martinez-Alier, Joan. *The Environmentalism of the Poor: A Study of Ecological Conflicts and Valuation.* Cheltenham UK and Northampton MA: Edward Elgar, 2002. Print.

Phillips, Ari. "The Really Scary Thing About Those Jaw-Dropping Siberian Craters."*ClimateProgress*. ThinkProgress. 1 Aug. 2014. Web. 5 Aug. 2014.

Picketty, Thomas. *Capital in the 21st Century*. Trans. Arthur Goldhammer. Cambridge and London: Harvard University Press, 2014. Print.

Rockström, Johan, et al. "A Safe Operating Space for Humanity." *Nature* 461 (2009): 472-75. Web.

---. "Planetary Boundaries: Exploring the Safe Operating Space for Humanity." *Ecology and Society* 14:2 (2009), article 32. Web.

Rosewarme, Stuart, James Goodman, and Rebecca Pearse. *Climate Action Upsurge: The Ethnography of Climate Movement Politics*. London: Routledge, 2014. Print.

"Science." *350.org.* Web. 21 July 2014.

Shiva, Vandana. *Making Peace with the Earth: Beyond Resource, Land, and Food Wars*. New Delhi: Women Unlimited, 2012. Print.

Spross, Jeff. "Right Now We 'Grossly Underestimate' Economic Damage from Climate Change, New Paper Says." *ClimateProgress*. ThinkProgress. 16 June 2014. Web. 23 June 2014.

Symploke: A Journal for the Intermingling of Theoretical Scholarship, *Critical Climate*, 21:1-2 (2014).

Zimmer, Carl. "Putting a Price Tag on Nature's Defenses." *New York Times*. 5 June 2014. Web. 11 June 2014.

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