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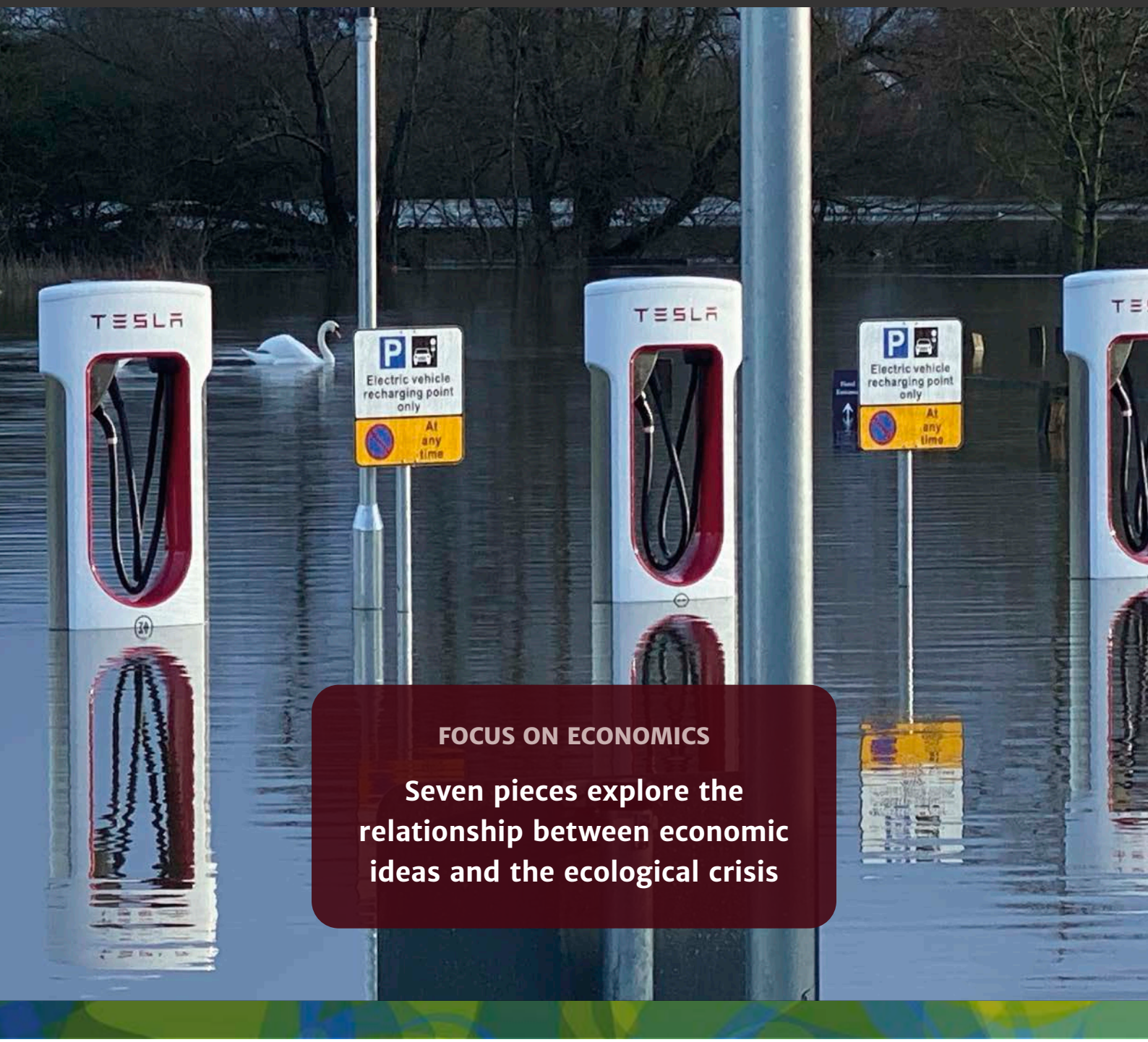
CONFRONTING HUMAN SUPREMACY IN DEFENCE OF THE EARTH



FOCUS ON ECONOMICS

Seven pieces explore the relationship between economic ideas and the ecological crisis

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Tesla car charging points at Sindlesham, UK, underwater owing to heavy winter rain.

Phil Creighton, Editor of *The Wokingham Paper*

The Ecological Citizen

An ecocentric, peer-reviewed, free-to-access journal

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Aims

1 Advancing ecological knowledge
2 Championing Earth-centred action
3 Inspiring ecocentric citizenship
4 Promoting ecocentrism in political debates
5 Nurturing an ecocentric lexicon

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Because of the extent to which some non-ecocentric terms are embedded in the English language, it is sometimes necessary for a sentence to deviate from a perfectly ecocentric grounding. The 'natural world' and 'environment', for instance, both split humans from the rest of nature but in some cases are very difficult to avoid without creating overly complex phrases. For usage notes relating to terms such as these, when they appear in the Journal, along with other language considerations, please visit: www.ecologicalcitizen.net/lexicon.html.

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> "We require alternative economic institutions that prioritize ecological restoration and just distribution."
>
> **Joshua Farley** (p 31)

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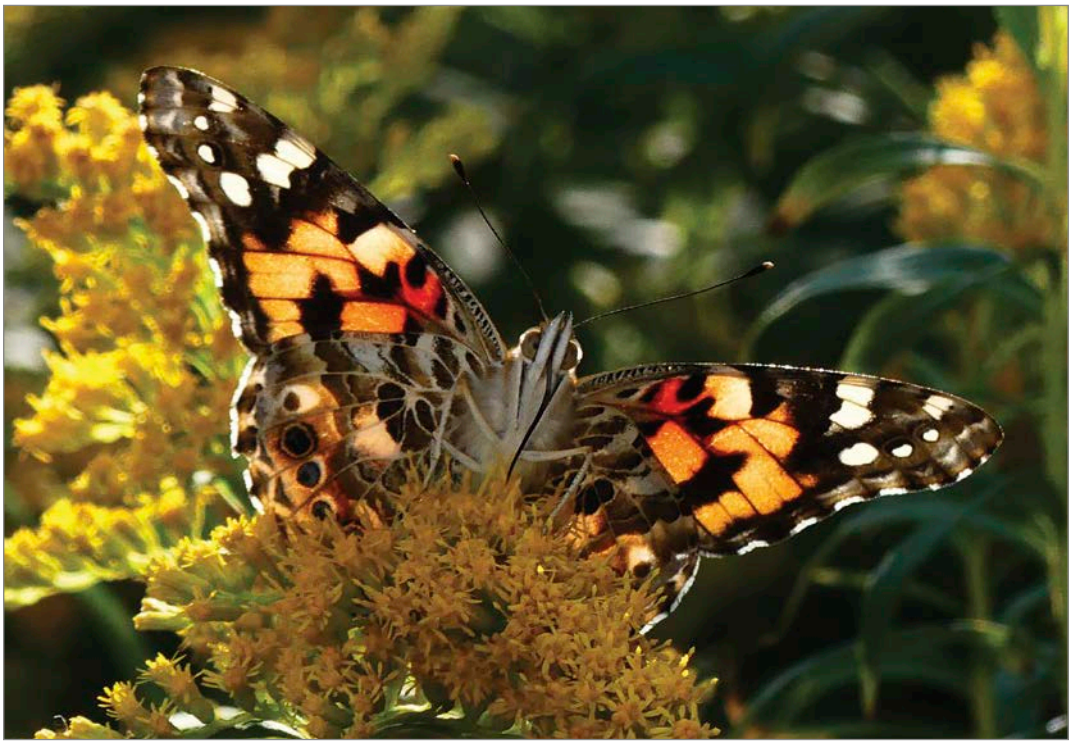

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This issue features a series of nature photos taken by Ian Whyte.

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Ecocentrism, economics and commensurability

Adam Dickerson

> "Whatsoever is not conscious of itself and not master of itself is a thing. Whatever is conscious of itself and master of itself is a person. [...] Man alone is a person; minerals, plants and animals are things. From the rational point of view, the purpose of things is under the dominion of the purpose of persons. [...] If there were only one man in the world he would be master of all things."
> (Walras, 1954: 62)[1]

The discourse of economics – at least in its orthodox, 'neoclassical' form, as taught to tens of thousands of university students every year – wields tremendous institutional, and therefore social, power. One very significant form that that power takes is via the centrality of quantified cost–benefit analysis to government policy making around the world. Consider, for example, the rules for policy formulation laid down in the UK Treasury's 'Green Book', or by the US's little-known but powerful Office of Information and Regulatory Affairs.[2] In each case, the possible forms that policies can take, and which policies are adopted and which rejected, hinge on the outcomes of cost–benefit analyses. The result is that, whilst experts in the field (such as climate scientists or ecologists) may receive a hearing in policy formulation, the last word on the matter often goes to the economists.

Given this influence and power, it is essential for us to ask whether there could be an *ecocentric* economics – and what it might look like. Ecocentrism is an ethical stance built around the proposition that other-than-human nature possesses intrinsic value. Is that ethics compatible with economics? Or is economics, as a discipline, committed in some basic, fundamental way to anthropocentrism? Certainly, the latter thought is encouraged by passages like the one quoted above from Léon Walras's great founding text of neoclassical marginalist analysis, the *Éléments d'économie politique pure* (4th edition, 1899). But perhaps passages like this, extolling human mastery over non-human nature, are inessential to economics proper; perhaps they are of no more relevance to economics than Newton's occultism is to the theories of classical mechanics.

That would certainly be the mainstream view, in which economics is conceived of as a 'positive science' whose relationship to ethics is easily stated. According to this view, ethics sets the *ends* (or goals) and economics studies *the most efficient means* to achieve those ends. This conception is expressed, for example, in Lionel Robbins's famous definition of economics as "the science which studies human behaviour as a relationship between ends and scarce means which have alternative uses" (Robbins, 1935: 16). It's a conception that is central to the self-understanding of mainstream economics, and that is found, in various formulations, repeated in textbook after textbook. On this view, economics is the systematic study of the most efficient means to achieve any given end. The rational principles of efficiency – getting more output from less input – are, it is claimed, able to be theorized and described independently of the specification of any end.

If this view is correct, then economics is not intrinsically anthropocentric. Indeed, on this conception, it makes no ethical assumptions, and is thus compatible with any ethical stance whatsoever. An

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Ecological economics

'ecocentric economics' would therefore not be a distinctive approach to economics; it would simply be economic reasoning in the service of ecocentric ends. From this perspective – of economics as the ethically neutral science of instrumental rationality – a polity could choose to set ecocentric goals as its ends, and then economics would help to work out the most efficient means to achieve those ends.

However, things aren't that simple. Even this very abstract account of economics – as *the systematic study of efficiency in means* – already implicitly embeds a substantive ethics. Namely, it presupposes an anthropocentrism, in which humans are conceived of as the 'masters of all things'.

To see why this is the case, let us consider an artificially simple case. Suppose there are two different processes for producing a given material good. Which of the two is more efficient? In order to make this judgement, we need to see which process involves a *smaller quantity* of inputs (given the assumption that both processes produce an identical output). If the inputs to a production process were all of one homogenous type, then this comparison would be easy. But this is not the case, for any production process will involve many heterogeneous inputs. One process may involve a certain amount of skilled labour time, while the other may use more labour time but at a lower skill level. One may rely on a small amount of capital in the form of simple machines, while the other may involve much more complex machinery. The two processes will use up different quantities of resources (including energy) in the production of the good, and will produce different waste products that will need to be dealt with in different ways. Now, given the variety of inputs to the two processes, how are we to judge which is more efficient – that is, which one uses less inputs in order to produce the good as an output? In order to rank the two processes in this way, it seems that all the complex inputs of each process need to be valued using a *common measure*. This common measure is, of course, exchange value or *price*. The most efficient means is that which produces the greatest exchange value at the lowest cost.

This is precisely the conclusion reached by Ludwig von Mises in his post WW1 debate with Otto Neurath over the possibility of rational economic planning in a socialist economy. Drawing on his experience as a war time economist, Neurath (2005) had argued that economic planning could and should be done 'in natura' – that is, in terms of the actual quantities of real things involved (so much iron ore, so much copper, so much timber, so many hours of human labour, *etc.*). In response, von Mises argued that although very simple cases can be compared using *in natura* measures, any matters of real complexity can be rationally compared only through the use of market-discovered prices. "Without such assistance," von Mises writes, "in the bewildering chaos of alternative materials and processes the human mind would be at a complete loss. Whenever we had to decide between different processes or different centres of production, we would be entirely at sea" (1951: 118).

Von Mises's response to Neurath has since become part of the received common-sense of mainstream economics: that rational assessment of efficiency demands the use of price as a common metric. In turn, this entails that all values (at least, all values of relevance to economic planning) are *commensurable*.[3]

It is precisely this commensurability that gives economics so much of its institutional power; what so often gives it the 'last word' in battles over policy formulation. For commensurability seems to hold out the promise of a purely technocratic mode of governance – in which the apparent objectivity of a cost–benefit analysis replaces all the messiness and inconclusiveness of politics and ethics. For if all values are commensurable through price, then it might seem that all economic decisions can be made – indeed, are most objectively and properly made – via cost–benefit analysis.

Hence, commensurability can appear to entail that, rather than having to sort out conflicts between different values

"It is precisely this commensurability that gives economics so much of its institutional power; what so often gives it the 'last word' in battles over policy formulation."

through the usual human practices of argument, persuasion, compromise, *et cetera*, collective decision making can become a technical exercise in accounting. This is attractive to the bureaucrat, who can then appear to govern in a way that is purely a technical, algorithmic exercise, outside of politics and ethics. And it suits those who want to see the socio-economic *status quo* maintained, because of the way it excludes the public by making policies that systematically benefit the wealthy appear to be matters decidable only by experts – preferably from behind a screen of mathematics.

There are many ways of criticizing this claim of universal commensurability by price. For example, there are various technical criticisms that could be, and have been, made of the methods (contingent valuation, hedonic regression, *etc.*) that are used to place a 'shadow price' on things that are not (yet) bought and sold in real markets. These methods were pioneered in so-called 'environmental economics', and have been applied – or misapplied – to produce claims such as that whales are "a one trillion [US] dollar asset to humanity" (Stone, 2019), and that the exchange value of 'ecosystem services' to human beings is "US$125 trillion per year" (Costanza et al., 2014).

But let us here focus on a deeper problem than the technical. Whatever its proponents might like to suggest, commensurability via price is not 'ethically neutral'; it is not 'above' or 'prior to' ethics; it is not a 'merely technical' or 'formal' or 'algorithmic' exercise. *It is an ethics.* To make different values commensurable in this way is to create a particular moral community, and a particular sort of moral actor. It is to create a community in which all and every value is rooted in a thing's status as a commodity – something able to be exchanged, in order to satisfy subjective human preferences.

Taken literally, the protest that 'a price cannot be placed on nature' is thus wrong – the danger is precisely that it *can* be. That price is then given social reality by the institutions (financial markets, government cost–benefit analyses, insurance company practices, contracts, and so on) that are in place. However, what has occurred here – and what is really underpinning that protest – is that the pricing is not merely an explicit *recognition* or *revelation* of an underlying value that 'had been there all along' (only implicitly). To assign a price to something – whether via a market mechanism or in some other way, such as a Pigovian tax on 'externalities' like pollution – is to *transform* the relationships we have to that thing; it is to form a different moral community.

The commensurability thesis is intrinsically anthropocentric. For the valuation of nature is given by us (human beings) – by *our preferences*, by our willingness-to-pay-for or our willingness-to-accept-compensation-for. Other-than-human nature has no say in this (*cf.* Spash and Clayton, 1997). Hence, the idea of commensurability through price should be rejected by anyone committed to ecocentrism. The very idea of commensurability through price embodies the anthropocentric idea that, in the words of Walras quoted at the start of this essay, human beings are the 'masters of all things'.

Three things immediately follow from a rejection of commensurability. First, there is no technocratic substitute for ethics and politics – that is to say, there is no technique that can be used to make collective decisions, where that technique is somehow 'above' or 'beyond' ethics and politics. A cost–benefit analysis, for instance, always embeds ethical and political assumptions. Just to take one example, any cost–benefit analysis must make use of a 'discount rate' to assess the value of things that will happen in the future. But the choice of discount rate is never a 'merely technical' exercise. *Whichever* rate is chosen implicitly involves ethical presuppositions about such matters as the appropriate responses to risks and uncertainty, the value of things to future generations of human beings, the value of things to non-human animals, and so on and so forth (*cf.* Spash, 1993).

Second, economics is no 'master discourse', within which all problems can be framed, and which legitimately has the

"The commensurability thesis is intrinsically anthropocentric."

'last word'. Considerations of efficiency are, of course, relevant to some decisions in some contexts, but they are never 'trump cards' that automatically override other values. That is, efficiency is *a* value, but not *the* value. As Neurath pointed out long ago in his debate with von Mises, if there is no commensurability, then economic choices must be judged directly and holistically. Or as O'Neill and Uebel (2015: 50) sum up Neurath's point: "In the absence of a single unit of measurement for decision making, choice requires direct comparisons of alternatives in different dimensions. The consequence is that there is no possibility of excluding political and ethical judgments from even 'technical' decisions". That is, in the words of Aldo Leopold: "Examine each question in terms of what is ethically and esthetically [*sic*] right, as well as what is economically expedient" (1989: 224).

Finally, if there are non-commensurable values then there must be institutions other than market mechanisms to enforce those values – for markets respond only to prices.

What does all this entail for the question with which we began: what does it tell us about the possibility and shape of an *ecocentric economics*? There are at least two salient implications of the rejection of commensurability:

First, there is no 'value free discipline' or 'positive science' to be had here. When it comes to questions about how we should live and act, technical questions are such only against a backdrop of settled ethical and political assumptions. One of the roles of an ecocentric economics must precisely be to unsettle and disrupt the anthropocentric assumptions that structure so much current economic thinking (both capitalist *and* socialist).

Second, an ecocentric economics must, of necessity, overlap with much broader questions of ethics, politics and governance. Most crucially, it must tackle the profoundly difficult problem of how the intrinsic moral value of other-than-human nature can be embedded within economic decision making and governance. Approaches to this could include, for example, ideas of ecodemocracy, and the broadening of legal personhood and legal rights to other-than-human nature (*e.g.* Gray and Curry, 2019; Wilson and Lee, 2019).

"An ecocentric economics must tackle the profoundly difficult problem of how the intrinsic moral value of other-than-human nature can be embedded within economic decision making and governance."

In ecological economics, in steady-state economics, in green political economy and in other heterodox areas of economic thinking, there are rich bodies of thought that a future ecocentric economics can draw from, and build upon. What is needed, however, is not a 'merely intellectual' change, but a change in those social practices and institutions that give orthodox economics such power and influence. And that change will have to be part of a broader transformation of our society, for the institutional authority of orthodox, neoclassical economics is the ideological mirror of the fact that we live under global capitalism. Just as orthodox economics conceives of the world as a collection of commodities and reduces a plurality of incommensurable values to a monism of price, so does global capitalism make a monoculture of the world, our communities and our values.

* * * * *

The critique of neoclassical economics, of neoliberalism, of productivist assumptions and of capitalism is the topic of this special issue of *The Ecological Citizen*. It presents a collection of articles that examine some of the relationships between the ecological crisis and key economic ideas. The overarching question is: How can we organize the economy so that it can provide for the flourishing of both human beings *and* other-than-human nature?

Sam Alexander provides the introduction to this issue, with a broad survey of what a post-capitalist economy might look like. Josh Farley diagnoses the key problems in the endless pursuit of GDP growth and a blind faith in 'market solutions', and looks at the possibility of new economic institutions built around cooperation and altruism. Troy Vettese digs into the intellectual history of steady state economics, and argues that it is deeply influenced by neoliberal assumptions – assumptions that must be discarded

if we are to build a genuinely ecological economics. Richard Smith, as an argument for eco-socialism, looks at what might be involved in seriously reducing emissions from automobiles, as a case-study of how capitalism cannot make meaningful moves towards ecological sustainability – driven, as it is, by structural imperatives of growth and profit. Tony Lynch and Tanzimuddin Khan provide a powerful critique of the very idea of 'sustainable development' and argue for an ecocentric socialism. Finally, John Barry, working from a green political economy perspective, gives a critique of the economic logic of work, and the instrumentalism that it embeds.

Not all the thinkers here would be comfortable describing themselves as ecocentric. They also disagree widely amongst themselves – for example, about the extent to which tools of orthodox economics can be turned to ecological purposes, and about the extent to which market mechanisms can be made compatible with ecological ends. But – as noted above – ecocentric thinkers need to draw widely on the many strands of critical work in heterodox economics and political economy if we are to succeed in our fight against the dominant economic orthodoxies. Nor is work about human flourishing irrelevant to ecocentrism; for it is a key part of ecocentrism that human flourishing is intrinsically connected to the flourishing of other-than-human nature.

I thank all of the contributors for their generosity in contributing to this special issue.

On a more personal note, while I have been writing this editorial, my home, Australia, has been suffering from historically unprecedented bushfires. At the time of writing (late January 2020), approximately 11 million hectares have burned (equivalent to 90% or so of the area of England), an estimated one billion mammals, birds and reptiles have perished, and many species have likely been driven to extinction. I want to express my deep gratitude to the brave volunteers of both the Rural Fire Service and the Wildlife Information Rescue and Education Service (WIRES) for their extraordinary efforts in these dark times. Meanwhile, 'economic growth' is still the cry on the lips of my coal-smeared prime minister. In the words of Karl Marx, "*Après moi le déluge!* is the watchword of every capitalist and of every capitalist nation" (1954: 257). *Le déluge*, it seems, is almost upon us. ■

> "'Economic growth' is still the cry on the lips of my coal-smeared prime minister."

Notes

1 I am very grateful to my fellow editors, to Monica Carroll, and to Troy Vettese, for their generosity in commenting critically on previous drafts of this editorial. It is all the better for it – but, of course, any errors and infelicities that remain are entirely my own responsibility.

2 The latest edition of the 'Green Book' is HM Treasury (2018). OIRA's mandate – giving its economists veto power over all policy formulation – comes from Executive Order 12,866 (available at https://is.gd/Pn5p7w), which was first signed into law by Bill Clinton in 1993.

3 Non-commensurable values – or 'lexicographic preferences' as they are termed in economics – are little studied by economists, and certainly play no significant role in the orthodox mainstream. This is for the simple reason that, without commensurability, *none of the maths works any more* (*cf.* Spash, 2000). For an excellent discussion of the significance of commensurability to ecological ethics, see O'Neill (1993: ch. 7).

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Post-capitalism by design not disaster

This article examines how to proactively design the end of capitalism rather than simply waiting for its collapse. It argues that capitalism is unable to resolve the emerging crises, for capitalism cannot function without economic growth, yet for ecological reasons economic growth cannot continue. However, there is a coherent alternative political economy – degrowth – and the emergence of various grassroots alternatives that, suitably scaled up, could help to form a post-capitalist economy. But our culture is not yet ready to embrace degrowth, with consumer affluence and techno-optimism still at the heart of mainstream conceptions of the 'good life'. Nonetheless, it is important to keep alive these ideas of what an ecocentric, post-capitalist economy could look like, for in a crisis what today seems impossible or implausible can suddenly become possible and even probable.

Samuel Alexander

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Samuel is a lecturer with the Office for Environmental Programs, University of Melbourne, Melbourne, VIC, Australia. He is also a research fellow with the Melbourne Sustainable Society Institute.

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Ecological economics; limits; societal change; sustainability

This article addresses the subject of post-capitalist political economy. That is an intimidating topic, especially since transcending capitalism will be a monumental task. Capitalism certainly is not going to lie down like a lamb at the polite request of left-leaning environmentalists. What this means is that sustainability and justice advocates with radical visions of societal futures need to think very carefully about the question of *strategy*. More specifically, we must confront the question of where and how to invest our time, energy and resources, if we genuinely seek a fundamentally different type of economic system 'beyond capitalism.'[1]

Attempting to save capitalism through so-called 'green growth' is increasingly recognized as little more than neoliberal ideology, the function of which is to entrench the *status quo* while pretending to change (Smith, 2016; Hickel and Kallis, 2019). And yet hopes for an imminent proletarian uprising that abolishes capitalism and erects an eco-socialist utopia governed by an enlightened centralized state seems equally misconceived. This paucity of hope has led critical theorist Frederic Jameson (2003) to note that it is now easier to imagine the end of the world than the end of capitalism, although perhaps that says more about a sterility of contemporary political imagination than it does about our future. This exploratory article will share some thoughts on what might come after capitalism and how we might manage and drive this transition by design rather than disaster.

I say by design not disaster, hinting at a certain optimism, however it will become clear that there is, in fact, an underlying pessimism that shapes my perspective – a pessimism which some readers might share. Or, perhaps rather than 'pessimism,' a better term to describe my orientation might be 'apocaloptimism.' This neologism can be defined as the view that 'everything is going to hell but that things might still turn out okay.' While in truth I am neither apocalyptic nor optimistic, this term does evoke something of the grounded but cautious hope that will inform my analysis.

It will be argued that deepening crisis in the current system is probably unavoidable now; for a range of reasons, our time for a smooth transition may have passed. Nevertheless, I certainly will not use that to justify inaction or despair; quite the opposite. Indeed, the instability created by systemic crisis may be one of the prerequisites for deep societal change –

unsettling though that is to admit. Our challenge will be to turn deepening crises, as they emerge, into opportunities to create something other than capitalism: a post-capitalist society that better accords with our shared ideals for social justice, ecological viability and human flourishing.

If capitalism is coming to an end in coming years or decades as it collides with various ecological and financial limits, we can ask ourselves: *how can we proactively design the end of capitalism rather than wait for its collapse?* Or even, if necessary, how can we design the collapse of capitalism in ways that makes the best of a bad situation? These are the questions of an apocaloptimist.

Over the last ten years I have been part of a movement advocating for a 'degrowth' process of planned economic contraction (Alexander, 2009, 2015a, 2015b; Alexander and Gleeson, 2019). In what follows I am going to use this alternative economic paradigm to frame and analyse the political economy of post-capitalism. I don't expect anyone to *like* the terminology of degrowth – I know very well it is an ugly term – and it may never be the banner under which a social or political movement marches. But as a slogan for justice and sustainability, I maintain that degrowth captures an essential insight: it directly evokes, more clearly than any other term, the need for *planned contraction* of the energy and resource demands of overgrown or 'developed' economies. That is an agenda that mainstream environmental and social discourse refuses to acknowledge, because significant contraction of energy and resource demands is incompatible with ongoing growth in GDP. This growth fetish must be overcome (Hickel and Kallis, 2019).

The following sections offer some thoughts on why the degrowth paradigm signifies the most coherent political economy for a post-capitalist society and how such a transition might unfold. I will also highlight the role grassroots social movements and alternative economic experiments may need to play prefiguring degrowth economies and creating the cultural conditions for a politics and macroeconomics of degrowth to emerge.

Prerequisites for a degrowth transition

Recently the Danish political economist Hubert Buch-Hansen (2018) published a paper which outlined a conceptual framework that is useful for thinking about how paradigm shifts in political economy occur. He argues that there are four main prerequisites. There must be:

1. a crisis or series of crises that cannot be resolved within the existing political economy;
2. a coherent alternative political project;
3. a comprehensive coalition of social forces attempting to produce the alternative paradigm through political struggle and social activism;
4. broad-based cultural consent – even passive consent – for the new paradigm.

I am going to adopt this framework, add my own analytical flesh to its theoretical bones, and use it to discuss the question of a degrowth transition to a post-capitalist society. I hope this provides a useful and provocative broad-ranging analysis to get this special issue underway, although I am sure I will raise more questions than I answer.

Capitalism is not in crisis – capitalism is the crisis

The first prerequisite, then, for a paradigm shift in the existing political economy is *crisis* – but not just any crisis. It must be a crisis or series of crises in the system that the system itself cannot resolve. There are many reasons to think this prerequisite is met.

Growth economics is sometimes called the 'ideology of the cancer cell,' and this provocative metaphor neatly summarizes the fatal anomaly in capitalism, namely, that on the one hand, it *must* keep growing for stability, and, on the other hand, for various ecological and financial reasons, it simply *cannot* keep growing. Like a chorus of others, I do not believe capitalism can resolve this fundamental contradiction,

> "The first prerequisite for a paradigm shift in the existing political economy is *crisis*."

which is creating conditions for a new, post-capitalist paradigm to replace it. Today, a range of theorists (from radical reformers, to eco-anarchists and eco-socialists) argue that degrowth is a necessary feature of any coherent macroeconomic alternative (Kallis *et al.*, 2018).

The clearest way to understand the multidimensional crisis of capitalism is to grasp the so-called 'limits to growth' predicament, which I will now review very briefly, and this will also help frame and define the post-capitalist alternative of degrowth.

Limits to growth: A restatement

By a wide range of indicators, the global economy is now exceeding the sustainable carrying capacity of the planet. Climate change is perhaps the most prominent ecological transgression, but there is also biodiversity loss, resource depletion, pollution, deforestation, and a long list of other deeply unsustainable impacts. In the haunting words of James Lovelock (2010), the face of Gaia is vanishing.

It is important to understand the *extent* of ecological overshoot, because responding appropriately to the global predicament depends on a clear understanding of our situation. The ecological footprint analysis indicates that humanity would need 1.7 planets if the existing global economy could be sustained over the long term (Global Footprint Network, 2019). If the United States or Australian way of life were globalized to the world's population, humanity would need *four or five* planets worth of biocapacity, implying a need to reduce our 'first world' impacts by 75% or more.

Despite the global economy being in this state of ecological overshoot, it is also known that billions of people on the planet are, by any humane standard, under-consuming (Hickel, 2017). If these people are to raise their living standards to some dignified level of material sufficiency, as they have every right to do, it is likely that this will place further burdens on already overburdened ecosystems.

To make matters more challenging still, there are now 7.7 billion people on Earth, increasing by about 200,000 people everyday. Recent projections from the United Nations suggest we are heading for around 9.7 billion by mid-century and 11 billion by 2100.

All this calls radically into question the legitimacy of continuous economic expansion and rising material living standards in rich nations. And yet, despite the fact that humanity is already making grossly unsustainable demands on a finite biosphere, all nations on the planet – including or especially the richest nations – are seeking to grow their economies without apparent limit. It is assumed that a larger economy is always better; that ongoing growth is necessary for 'progress.'

One does not have to be a sophisticated thinker to see that this is a recipe for ecological disaster, although alarmingly this point seems to be lost on almost all politicians and most economists.

Capitalism cannot resolve its ecological contradictions

In theory, there are two broad ways to respond to the limits to growth predicament within capitalism. The first is to try to create a form of capitalism that deliberately stops growing and actually voluntarily contracts in order to operate within sustainable limits. The problem here is that there are various growth imperatives built into the structure of capitalism, which makes the notion of 'degrowth capitalism' a contradiction in terms (to be distinguished of course from capitalism in recession, which is *unplanned* economic contraction).

Therefore, the only other means of resolving the limits to growth predicament within capitalism is to radically decouple economic activity from environmental impact through what is called 'green growth.' The hope here is that technological innovation, market mechanisms and efficiency improvements will reduce energy and resource demands even as economies continue to grow in terms of GDP. Nice in theory, perhaps, but what is happening is that the absolute reductions in energy and resource demands needed

"By a wide range of indicators, the global economy is now exceeding the sustainable carrying capacity of the planet."

for sustainability are not occurring – certainly not to sufficient degrees – and as the global economy seeks ongoing growth, absolute decoupling gets harder and harder to achieve (Kallis, 2017; Hickel and Kallis, 2019). Efficiency without sufficiency is lost.

This brings us to the most egregious flaw in growth economics, which is the apparent failure to understand the exponential function and its ecological implications. Post-growth economist Tim Jackson (2009) has shown that if the OECD nations grew their economies by a modest 2% over coming decades and by 2050 a global population of nine billion had achieved similar income *per capita*, the global economy would be *fifteen* times larger than it is today. It is obvious that ecological limits will not permit that scenario to eventuate. Even an economy twice as large as today's economy would surely wreak ecological havoc. The critical point is that the degree of 'decoupling' required to make ongoing growth 'sustainable' is simply too great.

> "Capitalism wants or needs what it cannot have: that is, limitless growth on a finite planet."

So capitalism wants or needs what it cannot have: that is, limitless growth on a finite planet. This ecological predicament is the defining contradiction of capitalism in the 21st century, insofar as growth is now causing the problems that growth was supposed to be solving. This suggests that the first prerequisite of a paradigm shift in political economy is well and truly met: capitalism is facing a multi-dimensional crisis that it cannot resolve, and therefore, sooner or later, capitalism will come to an end. The question of our time, as stated in my introductory comments, is how to make the transition beyond capitalism by design rather than disaster.

The crisis of ecological overshoot also provides insight into what any alternative must look like. Broadly speaking, the implications here are clear but radical: if the global economy is to operate within the sustainable carrying capacity of the planet, this requires (among other things) the richest nations to initiate a degrowth process of planned economic contraction, on the path to a 'steady state' economy of stable and sustainable biophysical throughput. Obviously, the poorest nations would also need to achieve some 'steady state' in time, but first their economic capacities must be developed in some appropriate form to ensure basic needs for all are met. However, the focus of this discussion is the wealthy nations.

An alternative political project

The second prerequisite for a paradigm shift in political economy – for a degrowth transition, in particular – is the existence of an *alternative political project*. This is not the forum to comprehensively defend this alternative political project, so I am just going to state it, or one version of it, in order to show that an alternative post-capitalist political project is beginning to take form.

The following political agenda is, in my view, both coherent and attractive, but it is, all too obviously, disconnected from political 'realism' in developed nations (or anywhere) today. Of course, I would argue that this is an indictment of mainstream politics, rather than of degrowth. However, the political and social unpalatability of degrowth is a point to which I will return, because it has implications for the question of strategy. But as an exercise in political imagination, these policies could initiate a transition to a degrowth society.

- **Alternatives to GDP:** Any political transition beyond capitalism requires transcending the GDP fetish (Hamilton, 2003) and establishing better and more nuanced ways to measure societal progress, such as the Genuine Progress Indicator (see Kubiszewski *et al.* [2013]). Post-growth measures of progress like this open up space for political parties to implement policy and institutional changes – including those which I am about to review – which would genuinely improve social wellbeing and enhance ecological conditions, even if these would not increase, and probably even decrease, GDP.
- **Diminishing resource caps:** If the rich, overgrown economies are serious about moving toward a just and sustainable human inhabitation of Earth, then first, we must acknowledge that we are hugely over-consuming our fair share of global

resources, and second, we must institute diminishing resource caps which put strict limits on national resource flows. Fortunately, this would incentivize the efficient use of resources and dis-incentivize waste, and lead to degrowth in ecological impacts. Eco-socialists would argue that reducing societal material and energy flows will require significant nationalization of key industries for stability during the planned contraction (*e.g.* Smith, 2016) whereas eco-anarchists would argue that a confederation of small self-governing communities would be the better path (*e.g.* Trainer, 2010). This debate is likely to continue (Alexander and Burdon, 2017) and it may be this controversy can only be resolved through practical experimentation not theory.

- **Reduced working hours (in the formal economy):** One obvious implication of diminishing resource caps is that a lot less resource-intensive production and consumption would take place in a degrowth economy. This would almost certainly lead to reduced GDP. To avoid the unemployment that typically flows from declining GDP, a degrowth economy would reduce work in the formal economy and share available work amongst the working population. Financial security in a contracting economy could be maintained through policies such as a Universal Basic Income, Universal Basic Services or a Job Guarantee.
- **Rethink government spending:** Currently, governments shape many of their policies and spend much of their money in order to promote economic growth. Under a degrowth paradigm, it follows that the ways government spend their funds would need to be fundamentally reconsidered. For example, fewer airports, roads, and military equipment; more bike lanes and public transport. How we spend our money is one way to vote for what exists in the world. Rethinking government spending would also need to go hand in hand with transformations in the systemic provision of basic services. For example, Cubans have better health on average than US citizens and yet spend an estimated 90% less on healthcare *per capita* (Hamblin, 2016). This suggests that there is ample room to provide for basic services in an affordable way while also making more public money available to fund other social projects (like a Universal Basic Income or renewable energy technologies).
- **Renewable energy transition:** In anticipation of the foreseeable stagnation and eventual decline of fossil fuel supplies, and recognizing the grave dangers presented by climate change, a degrowth economy would divest from fossil fuels and invest in a renewable energy transition with the urgency of 'war time' mobilization. This will be much more affordable and technically feasible if energy demand across society is greatly reduced, and that is a key feature of a degrowth society (Alexander and Floyd, 2018). The energy transition needed cannot just involve 'greening' the supply of energy, it must also involve greatly reduced demand. This means anticipating and managing what David Holmgren calls 'the energy descent future' (Holmgren, 2018).
- **Banking and finance:** Our systems of banking and finance currently have a growth imperative built into their structures. Any degrowth society would have to create systems that did not require growth for stability. Debt jubilees would probably be required, especially with respect to the poorest nations. These are particularly complex issues and the forces of opposition will be fierce. But the point is that any post-growth transition is going to require deep changes to the most fundamental financial institutions of capitalism.
- **Population policies:** This is always controversial territory, especially in an age of Trump, but the environmental logic is compelling. As population grows, more resources are required to provide for the material conditions of human wellbeing. As Paul Ehrlich once said, "whatever problem you're interested in, you're not going to solve it unless you also solve the population problem." I will not suggest specific policies here; the point is

"Any degrowth society would have to create systems that did not require growth for stability."

that we need to discuss this topic openly and with all the wisdom and compassion we can muster (*e.g.* Kuhleman, 2018). Population policy must be part of any coherent politics of sustainability in recognition that we live on a 'full Earth.'

- **Distributive justice:** Last but not least, environmental concerns cannot be isolated from social justice concerns, both nationally and globally. The conventional path to poverty alleviation is via the strategy of GDP growth, on the assumption that a 'rising tide will lift all boats.' A degrowth economy would recognize that a rising tide will sink all boats, and thus poverty alleviation must be achieved much more directly. Rather than growing the economic pie, a politics of degrowth would slice the economic pie differently through a major redistribution of wealth and power. Prominent policies in this space include the notion of a Universal Basic Income, while others argue for a Job Guarantee, or Universal Basic Services (see Mitchell and Wray [2005] and Frankel [2018]). These types of policies would go a long way to directly eliminating poverty, with inequality further reduced by policies such as maximum wage legislation, and progressive wealth, income and land taxes. Again, eco-socialists would argue that a just distribution of wealth and power would have to involve significant socialization of property and curtailment of 'the market.' How far socialization would need to go, and the nature of such a transformation, is obviously open to debate.

> "Our best hope for inducing a degrowth transition by design is to build a post-capitalist economics 'from below'."

These policy platforms – all in need, of course, of far more elaboration and discussion – are coherent political, economic and social goals if a transition to a degrowth society were recognized as necessary. Each of these policies could take various forms, and there is, and should be, debate within the degrowth movement and beyond about various ways to structure a post-capitalist society. But my present point is simply that a relatively coherent and developed alternative politico-economic project is emerging to replace the capitalist paradigm. So, the second prerequisite for a paradigm shift is also arguably present, which is to say: there is a coherent, alternative political economy.

Nevertheless, as implied above, I am the first to admit that this policy platform, coherent though it may be (to my mind), is so unpalatable to the dominant cultural consciousness that it would be political suicide for any political party to try to implement it at present. In other words, what is arguably politically necessary is both socially and politically unthinkable – which is one reason, no doubt, for our current state of despairing political paralysis.

Because of this situation, whereby the politically necessary is unthinkable, I would argue that the policy platform outlined is unlikely to *initiate* a degrowth transition, but will only ever be the *outcome* of social movements; the outcome, that is, of social forces that emerge out of crisis or a series of crises and which actively create the cultural consciousness that see policies for degrowth as both necessary and desirable (Alexander and Gleeson, 2019). It is through crisis that I see the citizenries in affluent societies being shaken awake from the depoliticizing effects of affluence. Encountering crises can play, and might have to play, an essential consciousness-raising role, if it triggers a desire to learn about the structural underpinnings of the crisis situation itself.

While I do not deny the need for, and desirability of, deep structural changes in the nature of our economic and political systems, what I am proposing is that a post-capitalist government may only be the outcome, not the driving force, of a transition to a just and sustainable society. In other words, our best hope for inducing a degrowth transition by design is to build a post-capitalist economics 'from below,' within the shell of the current system that is currently in the process of deteriorating (Alexander and Burdon, 2017). Waiting for government to act would be like waiting for Godot – a tragi-comedy in two acts, in which nothing happens, twice.

Support from a comprehensive coalition of social forces

This leads me to the third prerequisite for a degrowth transition, and that is that it must have support from a comprehensive coalition of social forces. Again, space does not permit an in-depth review of these issues, but a few comments will be made on examples of post-capitalist grassroots activities that are exploring modes of economy that are transcending the profit-motive for the common good, or simply building new forms of informal or household economies 'beyond the market.' These can easily be seen to be prefiguring aspects of a degrowth economy, even if this terminology is not used. Four key features of post-capitalism that I see emerging from the grassroots – features which I feel must scale up for a degrowth economy to emerge – are as follows.

1 Non-monetary forms of the sharing economy, whereby communities self-organize to share resources in order to save money, partially 'escape the market,' and avoid significant amounts of production (Nelson, 2018). Indeed, this is a key feature of why a degrowth economy could still thrive even when contracting in GDP terms: produce much less but share much more, for societies can create common wealth through sharing. This is part of what 'efficiency' means in a degrowth economy.

2 A degrowth economy is likely to require a transformation of the household economy: from being merely a place of consumption, to becoming a place of production and self-provision. On this topic there is no better place to look than the work of permaculturist, David Holmgren (2018), whose vision and insights here are indispensable. There are two main reasons why a resurgence of household economies is central to a degrowth paradigm shift (Alexander and Gleeson, 2019): First, by producing more within the household, less time is needed to work in the formal economy, leaving more time outside the market for social activism and community engagement. This strategy is about escaping capitalism in order to erode it, that is, building the new economy within the shell of the old. Secondly, if financial crises deepen in coming years, the household economy may be an essential means of meeting basic needs, so the task is to prepare now for what may well prove to be harder economic times ahead. We should aim for sustainability, but we may have to settle for resilience.

3 A key feature of a degrowth economy involves significant localization of the economy, moving toward a 'bioregional' economy where local needs are predominantly met with local resources, shortening the chain between production and consumption (Trainer, 2010).

4 Finally, any post-capitalist economy is going to require new modes of production, moving away from profit-maximizing corporations (often owned by absentee shareholders), towards an economy where worker cooperatives, community enterprises and not-for-profit models are the dominant forms of economic organization, paying people living wages but reinvesting surpluses back into the local community (Albert, 2004; Gibson-Graham *et al.*, 2013). Again, there are various ways to imagine such alternative economic arrangements. Experimentation may be required as societies pursue the goal of creating economic and social systems in which more wealth and power are held in common, rather than concentrating it in private hands.

It seems to me that alternative modes of economy, such as these four, are bubbling everywhere under the surface, which is a hopeful sign. The Transition Towns Movement, for example, is a coherent manifestation of this grassroots approach to building local, community economies. But one must also admit that these transgressive experiments remain small and marginalized by the dominant modes of political economy. So, in terms of the third prerequisite for a post-capitalist transition, we have to conclude that the social forces are mobilizing but have not

"Alternative modes of economy are bubbling everywhere under the surface, which is a hopeful sign."

yet been able to scale up to positively disrupt, or even significantly threaten, the dominant paradigm.

Cultural consent: The sufficiency imperative

The final prerequisite for a post-capitalist degrowth transition is broad-based cultural consent. Passive consent may suffice here, without the majority of people actively seeking degrowth. This really is a critical element in any planned transition in political economy and one that currently does not exist in terms of degrowth. It seems that the majority of people either do not think degrowth (or what it represents) is necessary or, if they do, they do not like what it means in terms of reduced and transformed consumption and production practices.

> "There will never be a post-capitalist politics until there is a post-consumerist culture that is prepared to embrace material sufficiency as a desirable way of life."

I think there are two main reasons why culture is not ready to embrace degrowth. The first reason is a deep-seated techno-optimism that shapes cultural thinking about environmental problems. This view assumes that technology and market mechanisms will be able to resolve the crises of capitalism without system change and without even much in terms of 'lifestyle' change. In other words, the *zeitgeist* seems to be that consumer affluence is consistent with justice and sustainability, because it is assumed that efficiency improvements in modes of production will be able to produce 'green growth' without having to rethink consumption practices (Hickel and Kallis, 2019).

Although this techno-optimistic blind spot is a major obstacle to degrowth, I hold some uneasy confidence that as capitalism continues to collide with ecological limits in coming years and decades, the case for degrowth will become clearer to more and more people, which could act as a mobilizing force. However, even if the crises of capitalism deepen and the majority of people come to desire a post-capitalist political economy, it does not follow that a degrowth economy is what they would demand. This points to a serious cultural obstacle to a degrowth transition: the fact that the dominant conception of the good life under capitalism is based on consumer affluence. It seems to me that there will never be a post-capitalist politics until there is a post-consumerist culture that is prepared to embrace material sufficiency as a desirable way of life (Alexander, 2015b). Herein lies the importance of the voluntary simplicity, simple living and downshifting movements. Although in need of radicalization (and organization for collective action), these movements or subcultures are beginning to create the cultural conditions needed for a politics and economics of degrowth to emerge.

It all depends on the ideas (and practices) that are lying around

When the crises of capitalism deepen – perhaps in the form of a new financial crisis or a second Great Depression – the task will be to ensure that such destabilized conditions are used to advance progressive humanitarian and ecological ends, rather than exploited to further entrench the austerity politics of neoliberalism. I recognize, of course, that the latter remains a real possibility, as did the arch-capitalist Milton Friedman (2002: xiv), who expressed the point in these terms:

> Only a crisis – actual or perceived – produces real change. When that crisis occurs, the actions that are taken depend on the ideas that are lying around. That, I believe, is our basic function: to develop alternatives to existing policies, to keep them alive and available until the politically impossible becomes the politically inevitable.

I do not often find myself in complete agreement with Milton Friedman, but on this point I am. It is essential for the ecocentric community to keep hopes of a radically different and more humane form of society alive, until what today seems impossible or implausible becomes, if not inevitable, then at least possible and perhaps even probable. And on those rare occasions when despair lifts and the human spirit shows itself in noble forms, 'the ideas that are lying around' and indeed 'the practices that are lying around,' look

so strong and convincing that it tempts even this apocaloptimist into considering becoming a plain, old-fashioned optimist. Or, with a nod to Gramsci, at least one is permitted to proceed with a pessimistic intellect and a cautiously optimistic will. ■

Notes

1 Without attempting a comprehensive definition, for present purposes the term 'capitalism' refers here to a political and economic system, based predominantly on private ownership of the means of production, in which most key decisions about the production, consumption and distribution of resources are made through market mechanisms.

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Green growth: Restorative economics for a post-carbon planet

Economic growth is driving ecological degradation on a scale that poses an existential threat to civilization. Gross domestic product now provides a better measure of *costs* than of benefits. We must transition to clean energy and simultaneously restore degraded global ecosystems. Neither of these activities are amenable to market allocation: ecological restoration provides collective benefits and requires collective decision making, while the value of green technologies is maximized when the required knowledge has a price of zero, in which case markets will not provide it. We thus need an economic transition towards institutions based on cooperation and reciprocity. One option that can help instigate the necessary transition is a common asset trust, in which R&D into green technologies is funded collectively then freely available to all. This low-cost initial step can help to spur the cooperation required to address larger challenges.

The world currently confronts a series of interrelated ecological and economic crises. Biodiversity sustains our ecosystems and all the services they generate, yet is currently being depleted at unprecedented levels. We are depleting renewable resources faster than they can regenerate, and using non-renewable resources to generate chemicals and waste emissions that threaten catastrophic harm to global ecosystems. Global climate change threatens catastrophic disruption of planetary ecosystems and the services they provide which are vital to our survival.

Markets are the major determinant of how quickly fossil fuels are burned, forests cut, soils mined and pollution spewed into the environment, which makes economic growth the driving force behind these crises (Daly and Farley, 2010). In turn, the driving force behind economic growth is fossil fuel consumption. All economic production requires energy, and fossil fuels account for about 80% of the energy used globally (British Petroleum, 2018). Fossil fuels are available as a finite stock that we can use to create economic products and waste emissions as fast as we choose (Georgescu-Roegen, 1971). Prior to the fossil fuel revolution, economic growth was uneven, uncertain and rare, and virtually all economic growth since then has increased the use of fossil fuels. Alternative energy sources – such as solar, wind and geothermal – are available as finite flows, and our capacity to capture them is currently inadequate to maintain the global economy, much less expand it (Hall and Klitgaard, 2011). Yet a string of recent reports suggests that failure to reduce net CO_2 to emissions to zero by mid-century poses an existential threat to civilization (*e.g.* Intergovernmental Panel on Climate Change, 2018; 2019).

The goal of this article is to explore the potential for a major economic transition. Our current era of economic growth and ecological degradation has been strongly associated with a competitive market economy driven by self-interest. This article presents the hypothesis that a sustainable economy capable of meeting people's basic needs must instead be based on unprecedented levels of cooperation and altruism. The hypothesis is not based on ideological leanings, but on technical considerations, namely, whilst the physical characteristics of fossil fuels favour competitive markets, the physical characteristics of alternative energy and the ecological crises we currently face favour cooperation and non-market allocation.

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The structure of the rest of this paper is as follows. First, it argues that what we currently call economic growth is actually *un*economic, with marginal costs exceeding marginal benefits, and must be replaced by green growth and degrowth. The paper then assesses a path toward green growth, defined as a quantitative increase in what is green: the ecological infrastructure essential to humans and all other species. It presents economic cooperation as inherently more efficient than economic competition when managing our most pressing problems. The paper then focuses on human behaviour, and the extent to which we are capable of the degree of cooperation required; it concludes by suggesting a possible path towards greater global cooperation.

Uneconomic growth, green growth and degrowth

Economists almost universally accept the law of *diminishing marginal returns*. This means that the more we have of something the less an additional unit is worth. This applies not only at the level of any given commodity, but also for the economy as a whole. For example, an increase in economic production provides far greater welfare in a poor country than in a rich country. Economists also generally accept the law of *increasing marginal costs of production*, and the principle clearly extends to ecological costs. Each additional ton of greenhouse gas emissions takes us closer to the tipping point of runaway climate change, each additional fish taken from depleted stocks or hectare of forest converted to agriculture may drive a species closer to extinction. At some point, the rising ecological costs of additional economic growth must surpass the diminishing marginal benefits. When we reach that point, growth becomes uneconomic, and continued growth makes us worse off than before (Daly, 2007).[1]

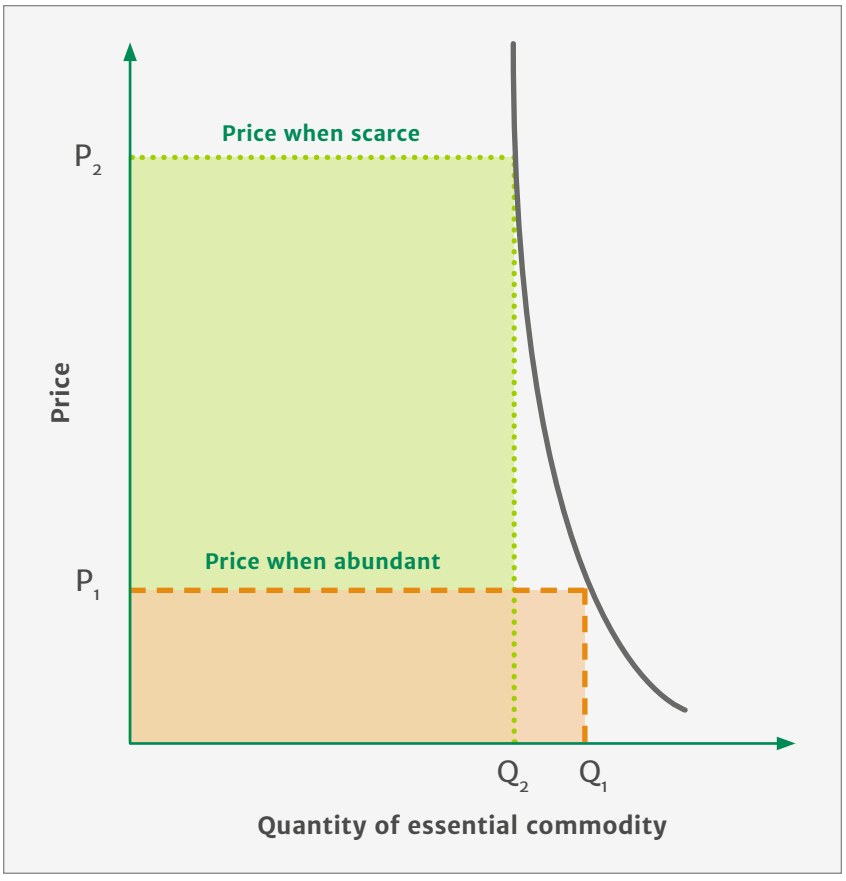

Figure 1. The contribution of essential commodities to GDP (measured by price × quantity of final goods and services) increases when supply decreases, and *vice versa*. $Q_1 \times P_1$ is clearly less than $Q_2 \times P_2$.

Economic growth is conventionally measured by gross domestic product (GDP), which fails to capture the costs of growth and hence the possibility for uneconomic growth. Furthermore, GDP responds perversely to quantitative changes in our most essential resources for which substitution is most difficult. Our demand for essential and non-substitutable resources such as food, energy, water, and lifesaving medicines is insensitive to price. That is, a small decrease in quantity supplied of such resources typically leads to a large increase in price, and *vice versa*. For example, when the supply of food grains decreased slightly in 2007–08 and 2011–12, prices doubled (Farley *et al.*, 2015). Now, GDP is the quantity of all final goods and services produced in a country multiplied by their price. Hence, when grain supply fell, its contribution to GDP nearly doubled, and the same is true for any essential resource. On the other side, increasing supply reduces the contribution of essential resources to GDP. In other words, GDP perversely shows a decrease in production as a gain in welfare, and an increase in production as a loss. Figure 1 illustrates this dynamic.

Most economists claim that adjusting GDP for inflation (or deflation) addresses these

problems, but inflation implies an increase in overall price levels independent of supply and demand, not the response of individual commodity prices to changes in supply or demand. Furthermore, any decent indicator of economic welfare should be amenable to disaggregation – it should measure the contribution to welfare for each sector of the economy as well as for the economy as a whole. GDP clearly fails this litmus test, which leads economists to absurd conclusions. For example, several famous economists, including Thomas Schelling and William Nordhaus, have claimed that global climate change will have minimal economic impacts because it primarily affects agriculture, which is less than three per cent of GDP (Daly, 2000; Schelling, 2007).

GDP also confuses costs and benefits. As computers get better and cheaper, their individual contribution to GDP can decrease even as they provide more benefits. The development of cost-saving technologies can also show up as a decrease in GDP, such as LED light-bulbs that reduce expenditures on electricity. Far more insidious, if scientists develop a clean, sustainable alternative to fossil fuels, or any green technology, the more people who use it as a substitute for environmentally destructive technologies, the more benefits it generates. Charging monopoly prices for the technology maximizes its direct contribution to GDP, but decreases the benefits it generates and hence its value. Value is maximized when the information underlying the technology is freely available to all and contributes nothing (directly) to GDP (Farley and Kubiszewski, 2015). Depletion of natural resources decreases society's wealth, yet increases GDP, as do major catastrophes such as oil spills, hurricanes and fires (Daly and Cobb, 1994).

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Call for Artists

Stephanie Moran, Art Editor, and Salomón Bazbaz Lapidus, Art Advisor

We are inviting artists to submit artworks to *The Ecological Citizen*. We are seeking full-page spreads across 2–4 pages, single-page artworks and individual smaller drawings and images. We are looking for a range of artworks that fit with the ecocentric ethos of the Journal.

Artworks may relate to the Journal's topic areas (see www.ecologicalcitizen.net/about.html), or be images of animals and other nature including but not limited to: observational drawings, landscapes of all kinds, macro and cosmic perspectives, and animal vision.

We are also looking for artists to respond to written articles with smaller drawings; please contact the Art Editor, via the contact form linked to below, if you would be interested in making work specifically in response to submitted articles.

Artworks must be suitable to place in an online journal format, to fit onto A4 pages, and should be provided in high resolution (300 dpi) at intended size for the A4 page.

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Beyond a certain level, there is also a very weak correlation between GDP and life satisfaction. Figure 2 shows this effect, though it is evident that wealthier countries on average do seem to be marginally more satisfied with life than less wealthy countries even at high levels of income. Plotted logarithmically, we would see a linear relationship between life satisfaction and *per capita* income (Deaton, 2013), but this also makes it clear that a country must quadruple its *per capita* income to increase by one point on the satisfaction scale, and the ecological costs of achieving this in rich countries are truly astronomical. Furthermore, within a single rich country, there is negligible evidence of a correlation between satisfaction and income over time – an absence known as the Easterlin paradox (Easterlin, 1974). The dark-grey circles connected by the dark-grey line represent the US, and show how, as the US has grown wealthier *per capita*, satisfaction with life as a whole has actually declined.

GDP is a measure of value added, and hence of benefits, but it is also a measure of what we spend, a cost. Costs often correlate with benefits, as we see from the cross-country comparison in Figure 2, but not always, as we see when looking only at the US. As another example of GDP as cost, the US has the world's most expensive health care system with worse outcomes than any other wealthy nation, but with the greatest contribution to GDP (Organization for Economic Cooperation and Development, 2019). No sensible person would call for maximizing expenditures on health care,

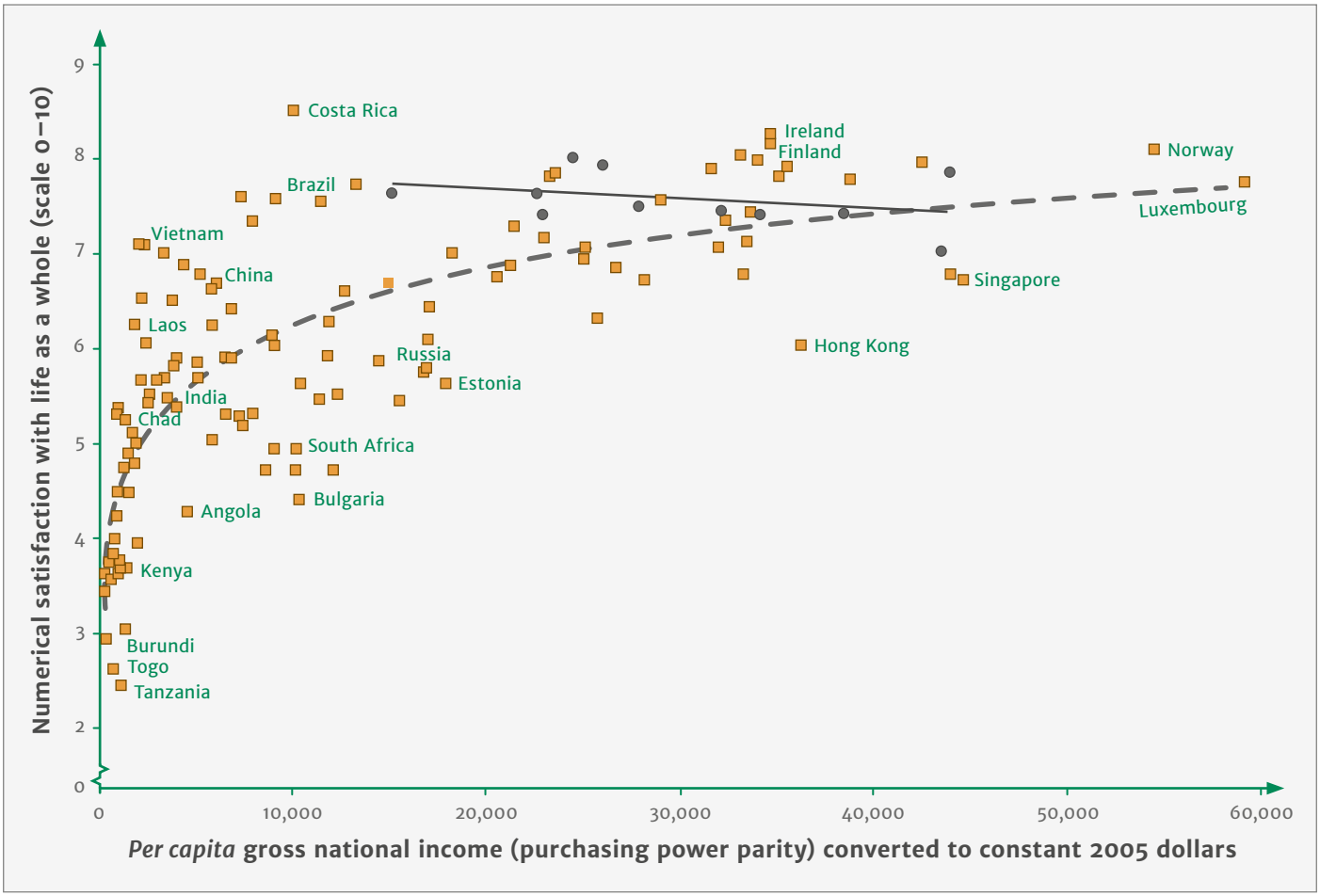

Figure 2. *Per capita* gross national income and mean satisfaction with life as a whole. The orange squares represent a cross-section of 121 countries around the world, and the dashed line a logarithmic trend. The dark-grey circles represent a time series for the United States, and the dark-grey line a linear trend. Sources: World Database of Happiness (http://worlddatabaseofhappiness.eur.nl, 2010); Bureau of National Economic Accounts, current-dollar and 'real' GDP (http://www.bea.gov/national/index.htm, 2007); World Bank Group, World Development Indicators (http://devdata.worldbank.org/data-query/, 2010).

but rather for achieving a long-lived, healthy population at the lowest possible cost. Treating GDP as a cost resolves all these perversities. Sometimes we need to spend more to get more, but pursuing increasing costs as a national goal is idiotic.

The solution to our current predicament is not conventionally defined economic growth, which is now uneconomic, but rather green growth in its most literal form – growing what is green. We must restore our seriously degraded global ecosystems in order to improve life for humans and other species. This means that we must slow the extraction of renewable resources to below their regeneration until they have been restored to levels that ensure the continued healthy function of global ecosystems. We must slow the extraction of non-renewable resources to below the rate at which we can develop renewable substitutes. We must emit wastes into ecosystems no faster than they can be absorbed, and in situations where pollution stocks have already accumulated to unsafe levels, such as greenhouse gases, we must emit wastes more slowly than they are absorbed, thus allowing stocks to decumulate. We must also strive to reduce our current population to sustainable levels, but leave this delicate topic to future articles.

While the world as a whole can no longer afford conventional economic growth, it is important to note that the world's poor do require more consumption in order to attain a higher quality of life. People who struggle to feed themselves or their children must focus on immediate survival, and cannot afford to invest in future ecological health. Most human beings would clear the last tree or kill the last fish to feed their children. Green growth will increase the productive capacity of forests, oceans and farmlands, thus helping the poor, but the poor will also require economic growth as conventionally defined. Green growth will therefore require a corresponding reduction in economic activity, or degrowth, by the world's rich.

Achieving green growth

The big question of course is how do we achieve green growth? This can be broken down into two separate questions: *where* do we invest, and *how* do we invest?

At the risk of oversimplifying, we have four types of stocks capable of yielding the flows of benefits required for a satisfactory quality of life. We refer to these as types of capital to stress that they should not be depleted, but with the explicit caveat that there is only a limited to negligible capacity for substitution between them, and most are ill-suited for market allocation.[2] Natural capital consists of the goods and services generated by well-functioning ecosystems. Social capital consists of networks of relationships, trust and community norms. Human capital includes education, knowledge and health. Built capital consists of human-made means of production and the artefacts we produce. Obsessed with economic growth, society has focused on these types of capital primarily as they contribute to GDP, driving private sector investments in the machinery and infrastructure required to transform raw materials and energy from nature into human made artefacts. We have neglected the provision, protection and restoration of non-market benefits to humans and other species, particularly those associated with natural, social and human capital.

Markets use the price mechanism to allocate raw materials to the final products that have the highest monetary value. They also use the price mechanism to ration those products, awarding them to the consumer who is willing to pay the most. This maximizes monetary value on both the production side and the consumption side. Markets are well-designed to increase GDP, albeit by allocating the marginal loaf of bread to the rich and overfed, rather than to the destitute struggling to feed their family (Farley *et al.*, 2015). However, markets only function well for resources that are both *rival* and *excludable*. A resource is rival when use by one person leaves less or lower quality for others. A resource is excludable when an individual or group can use it while preventing others from doing so. Markets are only possible for excludable resources. If exclusive property rights are not possible, then individuals can use a resource whether or not they pay for it, and there is therefore

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"In addition to ecological restoration, green growth requires environmentally friendly technologies that meet the needs of the poor."

no incentive for the market to provide it. Markets are only appropriate for rival resources, for which one person's use leaves less for others. For such resources, rationing is necessary, and price rationing is one option. When a resource is *non-rival*, on the other hand, use by one person has no impact on use by others. This is the case for most ecosystem services, such as climate stability, and also for information.[3] My use of a stable climate does not leave less for others to use, and my use of the knowledge required for green technologies does not leave less of that knowledge for others (Daly and Farley, 2010). Using the price mechanism to ration access to a non-rival resource creates artificial scarcity, which is inherently inefficient (Kubiszewski *et al.*, 2010).

Fossil fuels are of course both rival and excludable, and hence are suitable for market allocation. Raw materials provided by nature are also rival and for the most part, we have created laws that make them excludable. Competition for such resources is inevitable, and markets may be an effective way to channel this competition towards the greater good. Market competition however is likely to be the wrong tool for achieving green growth. Many of the most important ecosystem services are both non-excludable and non-rival. We collectively share the benefits of a stable climate, a healthy ozone layer or a resilient and biodiverse ecosystem. Furthermore, one person's use of these services does not leave any less available for others, so rationing access makes no sense. Such resources are unavoidably open access, so self-interested competition will not provide them. Instead, cooperative provision, protection and restoration is required.

There is competition for many oceanic resources and for global waste absorption capacity, which are both currently non-excludable. This is obvious, for example, for fisheries and oceanic mineral deposits. Less obviously, an ecosystem's capacity to absorb waste emissions is also rival. For example, global ecosystems absorb about 5 billion metric tons of CO_2 per year (Ballantyne *et al.*, 2012). If we are to avoid global climate change, we must reduce emissions to below this level, for which individuals, firms, and countries compete for access. However, limiting access requires global cooperation.

In addition to ecological restoration, green growth requires environmentally friendly technologies that meet the needs of the poor, such as clean, efficient and decentralized solar energy. Energy is such an important part of our economy that the nature of our energy sources can have a major impact on the nature of our economy: an energy transition may lead to an economic transition (Cleveland, 2007).

Careful analysis can show that cooperation is superior to competitive markets in determining which green technologies to produce, producing them at the lowest possible cost, and maximizing their value once they exist. To begin with, meeting the needs of the poor is the most cost-effective way to improve quality of life for society as a whole, but markets will only invest in technologies likely to generate profits. Given their lack of purchasing power, there is little profit to be made in producing pro-poor technologies. Markets also fail to reward the provision or protection of public goods, and therefore fail to invest in technologies that protect or restore most ecosystem services.

Markets also raise the cost of developing new technologies. The most important input into new technologies is existing knowledge – information is like grass that grows longer the more it is grazed. Isaac Newton could see farther because he stood on the shoulders of giants. Paying royalties on existing patents can significantly increase the costs of developing new technologies (Benkler, 2004).

Another difficulty with market-driven technology is that it can be difficult and expensive to make information excludable. The private sector already underinvests in green technologies since other firms can copy innovations at low cost, giving them a competitive edge over the firm that actually invested in it. The energy sector is among the least innovative of all industries, investing only about six per cent as much in research and development as the manufacturing sector (Avato and Coony, 2008). Private

sector investment in energy technology (research development and employment) has in fact fallen steadily since the 1980s, and accounts for only 0.3% of sales revenue in the US (Coy, 2010). Better enforcement of patents is very costly. Technologies that generate public goods or that meet the needs of the poor produce no revenue to pay patent royalties.

Once a technology exists, market prices can actually reduce its value. If a firm develops a clean, decentralized, inexpensive and safe alternative to fossil fuels, it would be able to sell the technology at a very high cost. If firms in in India and China cannot afford to pay, they will continue to burn coal and other fossil fuels, leading to continued global climate change. The value of information is maximized at a price of zero, but at this price, there is zero incentive for markets to provide the technology (Farley and Perkins, 2013).

Agriculture is also critical to green growth – it is one of the greatest threats to ecological function on the planet (Millennium Ecosystem Assessment, 2005), yet failure to maintain agricultural output is likely to have unacceptable impacts on quality of life. Agroecology can increase the provision of ecosystem services from agricultural land and also increase food production and farmer income from ecological restoration using agroforestry (De Schutter, 2010). Agroecological technologies are meant to spread from farmer to farmer. However, the private sector generally fails to invest in agroecology (Vanloqueren and Baret, 2009), favouring instead technologies that can be patented and increase market production at the expense of ecosystems.

The solution to these problems is not better enforcement of private property rights that reduce the value of information, but rather the cooperative, public provision of green technologies that are freely available for all to use. We also need scientifically informed collective decisions on the extent of ecological restoration required to avoid ecological catastrophe and maximize social welfare, funded by cooperative investments. The question is whether humans are capable of cooperation at the necessary scale.

Is cooperation possible?

Economists have long argued that people are by nature rational, self-interested and incapable of altruism, and that competitive markets fortunately channel the egoistic behaviour of *Homo economicus* toward the 'greatest good for the greatest number.' Evolutionists similarly argued that perfectly selfish individuals would increase their fitness at the expense of altruistic ones – hence, differential fitness drives altruistic genes extinct, and thus true altruism cannot evolve through natural selection (Dawkins, 1990).

More recently, however, behavioural economics and many other fields have investigated the ways in which people frequently care about fairness and the well-being of others, and are fully capable of altruism and cooperation. For example, in an experiment known as the 'dictator game,' an individual is asked to divide a sum of money with another anonymous individual. Any division is acceptable. A perfectly selfish individual would always offer zero, but most individuals offer something, often half. In a variation called the 'ultimatum game,' the receiving individual has the right to accept or reject the offer. An 'economically rational' individual would offer a minimal share, and an 'economically rational' recipient would accept it. In real life, however, most players offer a substantial share, with 50% being a modal offer, and most recipients reject offers they deem too low. In other words, the recipient is willing to sacrifice his or her own welfare in order to punish the offerer for being too selfish. When individuals are punished for being selfish, they are likely to be less selfish in the future (Henrich, 2016).

Adding more complexity, in the 'public goods game' all individuals are offered an initial sum of money, any portion of which they can keep or return to a common pool. Money in the common pool is doubled and redistributed equally to all. If all return their money to the common pool, all double their money. This is the cooperative outcome. However, individuals who hold their money also receive a share of the common pool. No matter what other players do, a single individual will do better holding

"The solution to these problems is the cooperative, public provision of green technologies that are freely available for all to use."

on to his initial endowment. However, when all individuals do so, social welfare is minimized. Played for a single round, some players donate all their money, some a portion, and others none. Played for repeated rounds, high donaters realize they are being exploited, and tend to reduce their donations accordingly, until after repeated games the average donation falls to zero. In contrast, in another variation of this game, contributions are public knowledge and players are allowed to punish defectors, spending one dollar to take away three dollars from selfish individuals. The punisher sacrifices her own welfare to punish others. When this rule is allowed, selfish individuals do poorly. After several rounds such games converge toward everyone donating the full endowment (Boyd *et al.*, 2003; Bowles and Gintis, 2004; Henrich and Henrich, 2007). Both theoretical and empirical studies have identified additional mechanisms that promote cooperation, including reciprocity, indirect reciprocity and group identity (Henrich and Henrich, 2007; Gintis, 2011; Nowak and Highfield, 2011).

Evolutionists have also made some very interesting theoretical and empirical breakthroughs. There is growing agreement that cooperative, altruistic behaviour can emerge at the group level. An empirical example can be helpful. Take a beaker of bacteria including *Pseudomonas fluorescence*. The bacteria compete for oxygen from above and food sources in the liquid. Competition grows fierce. A mutation of the *Pseudomonas fluorescence* emerges known as the 'wrinkly spreader.' This mutation creates a film binding wrinkly spreaders together in a cooperative mat that floats on the surface. With access to oxygen and nutrients, cooperators outcompete other *Pseudomonas*. However, within the cooperating group, bacteria can revert to the ancestral type that does not generate the film, yet remain buoyed up on the film of the cooperators, using the energy saved for reproduction. The selfish bacteria thus out-compete the cooperative bacteria within the group. However, as the population of selfish bacteria increases, the colony loses its buoyancy and plunges to the bottom (Rainey and Rainey, 2003). In other words, colonies with more cooperative individuals outcompete colonies with fewer cooperative individuals, and natural selection across groups favours altruism. At the same time, the selfish individual out-competes cooperative individuals within the group. There are thus evolutionary pressures driving both cooperation and selfishness. Humans evolved in small groups on the plains of Africa. Those groups with the most cooperators outcompeted the others and left more descendants (Wilson and Wilson, 2007). Cultural innovations, which are also subject to natural selection, have allowed us to promote cooperation and punish defection (Boyd and Richerson, 2005). In fact, the success of humans as a species and the success of specific human societies has depended on the ability to cooperate at larger and larger scales (Wilson, 2012; Harari, 2015).

The take home message from these studies is that humans exhibit a range of personality types from perfectly selfish to perfectly cooperative. We can develop institutions that will promote selfishness or cooperation, as required by the nature of the problems we face. We must hope we can develop new cultural innovations that allow us to scale cooperation to the global level.

> "We must hope we can develop new cultural innovations that allow us to scale cooperation to the global level."

Conclusion: A path towards cooperation

The fossil fuel powered, growth-oriented market economy has played a critical role in increasing human living standards, but at the same time has caused myriad problems that threaten the survival of human civilization and innumerable species. As determined by their physical characteristics, fossil fuels were well adapted to a market economy as long as their emissions had negligible impact on humans and other species – but this is no longer the case. We must now urgently replace fossil fuels with solar energy while slashing overall energy use, restoring degraded ecosystems, and continuing to satisfy the basic needs of all in an era of green growth. Green growth must be driven by the goals of ecological sustainability and just distribution, which

in turn require economic institutions based on cooperation. The process of developing these institutions will inevitably be based on trial and error. As we learn to cooperate at some scales for some problems, it will facilitate cooperation at larger scales and for other problems.

Since many of the most serious threats to global ecosystems were caused by the excessive consumption of the wealthiest nations, who have the most resources to spare, these nations should fund an open access common asset trust for green technologies. The models for this approach should be land grant universities (restored to their original role as the generators and disseminators of new ideas freely available to all) and commons-based peer production – the process underlying the development of open access software (Benkler, 2004), but with public funding. The resulting knowledge would be free to all who become members of the common asset trust, on the condition that all resulting improvements to the technology also remain free to use (Mustonen, 2003). In addition to reducing the costs of developing new knowledge and increasing the benefits, it would eliminate the considerable expenditures on patent enforcement. All members of the common asset trust would be encouraged to contribute to such an effort to the best of their abilities. Since some green technologies may cost more than fossil-fuelled alternatives, members of the common asset trust should impose substantial tariffs on non-members. Many economists are worried that some nations would 'free ride' on investments by others. However, such 'free-riding' on green technologies would help to protect the environment and thereby provide benefits for those countries that made the initial investments. That is, it is in effect impossible to free ride on green technologies. While information should be free, there is unavoidable competition for the green commodities it is used to produce. Market firms could compete to produce them at the lowest possible cost.

A green technology common asset trust is likely to be a sensible, efficient and relatively low cost approach to addressing some of our global challenges, but is clearly inadequate to address them all. The hope is that initial contributions by rich nations will lead other nations to reciprocate. Countries will bond together as members of a single group. Members will punish non-cooperators with substantial trade barriers. Reciprocity, group membership and altruistic punishment all build trust and promote cooperation, thus facilitating future efforts to tackle more complex challenges, such as large scale restoration of global ecosystems.

Capitalist, growth-oriented markets played a critical role in society's unprecedented wealth, but are equally responsible for the existential threats to human civilization and current ecosystems. Capitalism prioritizes individual choice: it becomes inefficient in a world of collective benefits and suicidal in one of collective costs. We thus require alternative economic institutions that prioritize ecological restoration and just distribution, such as common asset trusts with inalienable rights for future generations. Which institutions are most suitable depends on our goals and the resources at our disposal. From our current state, the price mechanism can be a useful feedback loop for addressing some problems, but believing prices alone will achieve some optimal equilibrium is magical thinking. On the other hand, I prefer apples to oranges, and markets are good for addressing questions of taste. Markets embedded within strong social norms of sustainability and justice may prove useful for achieving other goals as well. ■

"It is in effect impossible to free ride on green technologies."

Notes

1 I do not believe this 'point' is identifiable, quantifiable or fixed, but, in all likelihood, rich countries are engaged in uneconomic growth.

2 While I dislike the efforts to place monetary value on natural capital, even mainstream economists acknowledge the basic principle that capital should not be consumed.

3 It should be emphasised that I do not define ecosystem services as the benefits humans derive from nature, but rather in the Georgescu-Roegen (1971) sense of a *fund-service*. Ecosystems generate ecosystem services at a specific rate over time, and are not physically transformed into the services they generate. A forested watershed can regulate and purify a certain amount of water per day, and

is not physically transformed in the process. In contrast, forests are physically transformed into timber or fire wood at a rate we choose, a process that unavoidably affects ecosystem services. Just as public services are intended to serve all members of a human community and are explicitly outside the market sphere, ecosystem services serve all members of the biotic community and are equally ill-suited to market allocation.

"Capitalism prioritizes individual choice: it becomes inefficient in a world of collective benefits and suicidal in one of collective costs."

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Against steady-state economics

Underlying Herman Daly's ecological economics is a faith in markets, neo-liberal regulatory tools and theory, and Malthusianism. While Daly criticizes economic growth, he overestimates the ability of regulation to contain a capitalist economy within a 'steady-state'. Cap-and-trade is his main tool to regulate a steady-state economy, even though that tool emerged from neo-liberal thought and has been instrumental in stymying the environmental movement's progress. Moreover, the neo-liberal Julian Simon developed a powerful critique of environmentalism in the 1980s, which Daly has not responded to. Over the last half-century, neo-liberal environmental thought has cast a shadow over ecological economics, even though Daly seems unable to perceive its influence on his life's work. If the environmental movement wants to win the fight, then it needs an entirely new ecological economics.

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When the US environmental movement came of age in the 1960s and 1970s, activism in the streets was accompanied by scholars undertaking the long march through university departments. To cite but a few examples, environmental history became a fast growing sub-field, while the dismal science expanded to include a branch for ecological economics. By and large, academic environmentalism assumed the ideological posture of the movement that birthed it, and sought to safeguard its respectability, was uninterested in broader radical politics and oblivious to its manipulation by neo-liberals (Gottlieb, 1993; Dowie, 1995). While environmental historians have secured an ample swathe of territory within their discipline, history as a whole has suffered with the steep decline in student enrolment in many universities over the past generation. Economics may have been one of the few disciplines to flourish in higher-education's contemporary age of austerity, but ecological economists cling to a toehold within a discipline that has become hostile to their efforts. Thus, the gains from half a century of environmental scholarship has been less than one might have expected. However, this shortcoming can be traced to its inherent conservatism. The Right may think that environmentalists are watermelons – green on the outside and red on the inside – but the truth is they too often are pears, and white, after all, is the colour of reaction.

This article will focus on the fortunes of ecological economics through the works of Herman Daly, the field's best-known practitioner. Daly did not found ecological economics, whose roots can be traced back to the 1950s or even the 1910s, but he has greatly influenced how it is presently configured. More than anyone else he is responsible for the elevation of the 'steady-state' economy as an object of study. Appropriate for the genre of biography, Daly is not only an influential historical figure, but in many ways representative of his caste. A Texan born in 1938, Daly studied at Vanderbilt University under the tutelage of Nicholas Georgescu-Roegen, who perhaps is best known today for the classic in ecological economics, *The Entropy Law and the Economic Process* (1971). Georgescu-Roegen, like other members of the first generation of ecological economists that included Ezra Mishan (1967), Kenneth Boulding (1966) and Ronald Coase (1960), could succeed in the mainstream of neo-classical scholarship while dabbling in a

new sub-field. In contrast, their students specialized in environmental questions and for their efforts often found themselves barred from the top tier of the discipline. Daly taught for decades at Louisiana State University and the University of Maryland, and also put in a six-year stint at the World Bank. His influence amongst activists and scholars in the humanities has proven greater than amongst fellow economists.

In addition to increasing environmental concerns, another trend in economics during the 1960s was the discipline's creeping neo-liberalization (Mirowski, 2006). The mainstream was dominated by neo-classical economics, the nineteenth-century school based on marginalism and general equilibrium analysis. Neo-liberalism, appearing two generations later in the inter-war period, drew upon on an entirely different set of principles devised by Frank Knight, Friedrich Hayek and Ludwig von Mises. Philip Mirowski (2013) argues that neo-liberalism is best understood as an ideology predicated on the belief that the market is less a site of exchange than an omniscient information-processor. Thus, if the market can accumulate and process information faster than any other institution – especially central planning – then *all* institutions should be reorganized on a market basis. Although not a neo-liberal himself, Daly seems to underestimate the influence of neo-liberalism on his work, an omission that has dulled his critical edge and undermined the field of ecological economics more broadly.

> "Neo-liberal environmental thought has long cast its shadow over the field of ecological economics."

It is Daly's relationship to neo-liberalism that will serve as the analytical axis of this article. Notably, one of Daly's first articles, "On Economics as a Life Science" (1968), was published in the Chicago School's house periodical, the *Journal of Political Economy*. That article spelt out many of the principles of steady-state economics that he would continue to develop for the rest of his career. This includes a faith in markets, neo-liberal regulatory tools and theory, and Malthusianism. While Daly criticises economic growth, he believes that capitalism – history's most dynamic social system – can be restrained within a steady-state by a flimsy mesh of regulation. Cap-and-trade is his main regulatory tool to achieve a steady-state, even though it emerged from neo-liberal thought and has been instrumental in stymying the environmental movement's progress (Mirowski, 2013). Moreover, the neo-liberal Julian Simon developed a powerful critique of Malthusianism in the 1980s, which Daly ignored. Thus, neo-liberal environmental thought has long cast its shadow over the field of ecological economics.

Why is there economic growth?

Ecological economists tend to believe that the environmental crisis is a matter of misunderstanding, and one only needs to convince people of the foolishness of economic growth. Daly often speaks of economic growth as an 'addiction', 'ideology' or 'obsession'. Such language is typical for the field, which can be found in works by Tim Jackson (2009), Robert Costanza and co-authors (2016), and most recently, Giorgos Kallis (2019). Ecological economists endow the concept of GDP with talismanic properties, for they believe that it does not simply measure economic growth but also produces that effect. This is why Daly and his peers busy themselves to replace GDP with alternative measurements that include environmental factors (*e.g.* Lawn and Sanders, 1999).

The idea that economic growth is a process driven by beliefs rather than economic structures comes from the environmental movement itself. While remaining critical of developments that threatened prized natural areas, most environmentalists have shied from any rigorous theorizing about capitalism itself for that would risk seeming Marxist. The result is the vague, anti-business sentiment that pervades the movement, which is epitomized by John Muir (1908) blaming the "devotees of ravaging commercialism" for the destruction of the Hetch Hetchy Valley, and Gary Snyder's denunciation of the "secret heart of this Growth-Monster" (1990). The theoretical lacuna where capitalism should be has weakened the praxis of environmental activists and

scholarship by environmental academics. GDP, after all, is a rather new measure, only emerging in its present recognisable form in the 1940s, though efforts aimed at national accounting date back to the 1920s (Tooze, 2001; Schmelzer, 2016). Sustained economic growth, however, predates GDP by centuries, so how did capitalism ravage environments long before anyone bothered to track its progress? To understand why sustained economic growth exists at all, one has to delve deeply into the structures of capitalism itself.

Few have done this better than Ellen Meiksins Wood, a Marxist historian. In her seminal study, *The Origin of Capitalism* (2002), she defined capitalism as a system marked by the compulsion – not merely the opportunity – to participate in markets. While markets have long existed, capitalism is relatively new because it represented a system where people depended on markets completely, which set into motion the requirement to constantly increase labour productivity. "Material life and social reproduction in capitalism are universally mediated by the market," she explains, "so that all individuals must in one way or another enter into market relations in order to gain access to the means of life" (Wood, 2002: 7). This situation unconsciously emerged in medieval England, as lords lost their rights to directly control peasants and therefore could only access land and labour through the market. This set in train a competitive dynamic where lords were forced to increase the productivity of their tenants through agricultural 'improvement'. Even if they owned the land themselves, they could only maintain their class position by producing and selling at the going rate, otherwise they would eventually be ejected out of the dominant class. Notably, Wood stresses that labour productivity was often increased in energy-intensive and environmentally deleterious ways, a dynamic that elucidates the relationship between capitalism, economic growth and environmental degradation. Focussing on economic growth rather than the class relations that produce it ironically leads ecological economists to fetishize GDP and overlook the factors that better explain this process.

There is a strange overlap between Marxists and neo-liberals in their disregard for GDP. Neo-liberals would agree with Marxists that the most important heuristic of economic analysis is profit rather than economic growth *per se*. This contrasts with neo-classicists who have long been interested in national income accounting. This divergence between neo-liberals and neo-classicists can be traced back to the break between the two traditions. In the 1920s Hayek ran the Austrian Institute for Economic Research (*Österreichischen Institut für Konjunkturforschung*), an outfit set up by Mises to supply clients with insights into the business cycle. Quinn Slobodian (2018) has recently shown that these early neo-liberals dreaded the possibility that attempts to comprehend the economy as a whole would give socialists the confidence to plan it. In short, familiarity could breed contempt of the economy, engendering the aspiration that one could transcend the market through central planning.

As a response, Hayek transformed himself in the early 1930s from market expert to mystic, declaring the market to be an unknowable entity (1933; 1937; 1945). This was, he argued, because the knowledge that was dispersed amongst millions of individuals could be concentrated through the prism of the price system. The diffusion of knowledge meant that no single individual or institution could consciously replicate the efficiency of distribution unconsciously achieved by the market. Attempts to encapsulate the market's workings using neo-classical techniques of equilibrium analysis – let alone central planning – were doomed. If a firm could not know its own supply curve at any given time how could an economist know how the economy as a whole functioned? Marxists and neo-liberals would agree that it is profit rather than growth that is the metric that actually matters for capitalism, leaving growth as a mere byproduct of a different social logic.

Using Wood's framework, one can see that the only way to stop the drive for endless economic growth is to undo the necessity

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to participate in markets. That is, the conscious political control over production and distribution through central planning is the only way to stop and reverse capitalism's ceaseless incorporation of the natural world. Daly, however, believes that a steady-state economy could be realized within capitalism. "I wouldn't really take the view," he remarked recently to Benjamin Kunkel in the *New Left Review*, "that we should just abandon capitalism and opt for eco-socialism" (Daly, 2018: 96). His preferred model would be "Jeffersonian-type, small-scale capitalism, operating within scale and distributive limits" (Daly, 2018: 96). Yet, the centrality of profit means that it is impossible to imagine any capitalist calmly accepting the strictures that the ecological economists would impose on a steady-state economy.

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Capitalists would fight to remove any restrictions on economic growth not because of any 'growthmania' but because they fear falling behind competing national capitals, leaving them vulnerable to rout on the market, not to mention losing their class position in a socialist society. An inevitable revolt of the elites against the steady state would not be dissimilar from what happened in Chile in 1973. In the aftermath of that *coup d'état*, Ralph Miliband (1973) condemned the "Wise Men of the Left" who "have hastened to proclaim that Chile is not France, or Italy, or Britain" and harbour the delusion that a bloody reaction to socialism is impossible in the Global North. Environmentalists should heed Miliband's advice to create movements "able and willing to engender and encourage the effective, meaning the organized, mobilization of popular forces." Otherwise, they "may well be preparing new Chiles for themselves."

Neo-liberal nostrums

Ecological economists have escaped a Santiago-style bloodbath because their tools, especially cap-and-trade, do not work. Daly lauds cap-and-trade as "the policy most in accord with maintaining natural capital" (2005: 103–4) and because it is supposedly more efficient as it uses the market rather than central planning to achieve its aims. In this it can be seen how, although not a card-carrying neo-liberal, Daly ascribes to many precepts of that movement. For him, markets are sites to "exchange information" and he is critical of "direct allocation through central planning" (Daly, 2018: 96). As he told Kunkel, "if you try to get rid of markets, you're really creating a problem" (Daly, 2018: 97).

What is cap-and-trade? The government sets a limit on the use of a certain resource and creates fungible tranches of that use-right, which can then be auctioned off to firms to create a price. Confusingly, Daly sometimes refers to 'depletion quota auctions', a term he uses to signify cap-and-trade programmes that regulate industrial inputs (*e.g.* coal or petroleum), and he reserves the term 'cap-and-trade' for outputs (*e.g.* carbon dioxide), but they operate on the same principles.

Cap-and-trade is the alternative to prohibition and best-available-technology regulation to reduce pollution, techniques derided by neo-liberals as 'command and control'. Cap-and-trade was in fact developed as the neo-liberal alternative to another regulatory possibility that Daly does not consider: the neo-classical solution of taxing negative externalities. The latter was first formulated by Arthur Pigou in his *The Economics of Welfare* for instances where "external economies" created a "divergence between social and trade [*sc.* private] net product" (1920: 159). That is, externalities occur when non-participants in production are rendered "services or disservices," but "technical considerations prevent payment being exacted from the benefited parties or compensation being enforced on behalf of the injured parties." Pigou's solution was to tax unpaid costs, returning the market to equilibrium. In the case of positive externalities (*e.g.* pollination services given by a beekeeper), subsidies should be given to compensate the providers of such services so that they are produced at an efficient level (Meade, 1952).

Neo-liberals, however, fumed against the Pigovian concept of externality for the

same reason that they are wary of GDP: it is based on the assumption that the economy is knowable and that a planner (rather than the market) can accurately assess economic value. They countered that no civil servant could accurately estimate the cost of an externality because only prices that emerge from the market have any validity. The problem was thus how to create a market in environmental problems. Eventually John Dales of the University of Toronto provided a solution in his *Pollution, Property and Prices* (1968), where he outlined the cap-and-trade framework. In the 1980s and 1990s cap-and-trade programmes were implemented in a few jurisdictions, especially in fisheries and air pollution, but the deluge in market-based environmental regulation did not come about until the 2000s, after the US government inserted cap-and-trade into the heart of the Kyoto Protocol. The US had to overcome tough European resistance to this globalization of cap-and-trade because the latter had championed Pigovian taxation (Voß, 2007).

Yet, the track record for cap-and-trade programmes has been terrible. The largest and most important carbon market, the EU Emissions Trading System (ETS), produces enduringly low prices for carbon. "Money that might have been used productively to alter the energy infrastructure instead gets pumped into yet another set of speculative financial instruments," Mirowski laments, "leading to bubbles, distortions of capital flows, and all the usual symptoms of financialization" (2013: 339–40). At its nadir in 2013, carbon fetched €3 per ton and even now at the moment of writing in October 2019 the price is only €22 per ton. This is a far cry from an effective price for carbon. ExxonMobil, for example, estimates it would need to be US$2000 per ton for global warming to be limited to 1.6°C (Eaton and Carroll, 2015), which is in line with the Intergovernmental Panel on Climate Change's estimates (2018). The EU ETS was doomed from the beginning, as, in order to placate industry, too many permits and offsets were issued. As Raphael Calel (2013: 112) observes:

> In 2006 it became apparent that there was a surplus of allowances and their price collapsed [...] Phase 1 emissions are estimated to have been only about 3% lower than they would have been without the EU ETS [...] When EU ETS installations are instead compared directly to similar installations that were not covered by the EU ETS, although this has so far only been done for a very limited number of installations, even the modest 3% reduction vanishes.

Other markets, like the Chicago Climate Exchange and California's carbon market, have also experienced spectacular crashes and, in general, have proven useless in reining in emissions (Drury *et al.*, 1999; Cullenward, 2014). Many of the gains that have been achieved by cap-and-trade programmes, like the much vaunted Clean Air Act Amendments of 1990, upon closer inspection turn out to be due to residual technical standards and Pigovian regulation. "It is worth noting," Calel remarks, "that Title IV of the Clean Air Act, which establishes the Acid Rain Program, also includes special provisions that reward firms specifically for the use of scrubbers, so it is not entirely clear how much of this was the market's doing" (2013: 115). Similarly, cap-and-trade programmes in fisheries have rarely restored fish stocks (Acheson *et al.*, 2015). Instead they have allowed environmentally deleterious practices to continue or concentrated ownership in a few hands by expelling poor fishers into unemployment.

Mirowski argues that the recurrent failures of cap-and-trade programmes are intentional rather the result of sincere incompetence. In the case of carbon markets, he suggests that many neo-liberals are too smart to believe in climate-denial, but find it useful to buy time in the short-term. In the medium-term, (after climate-deniers are defeated) then cap-and-trade programmes can be set up but prices are rigged to stay low to avoid economic disruption. Moderate environmentalists, economists and incumbent firms will then fight to preserve cap-and-trade regulation, tying up political capital that could have

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gone into effective climate action. This buys yet more time for entrepreneurs to perfect forms of geo-engineering like 'solar radiation management', which represent the neo-liberals' permanent solution to climate change. If Mirowski is correct, then well-intentioned supporters of cap-and-trade like Daly have been conscripted unawares by neo-liberals. The true solutions to environmental problems like climate change are what neo-liberals dread: prohibition and central planning, even though ecological economists have come to abhor such measures.

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A truly effective cap-and-trade programme would put a damper on economic growth. The originator of cap-and-trade, Dales, was quite aware of this when he first began propounding his idea in the 1960s. As he told a reporter from the Toronto *Telegram*, "I would want taxes to go up. If we want cleaner air and water, we have to give up something to get it" (Telegram, 1968). While neo-liberals may appreciate the elegance of his solution, they were less keen on putting a straitjacket on the economy. Not for the first time, cap-and-trade shows that neo-liberalism may be an ideology that works in theory, but fails in practice. Sensitive as they are to the capitalist's need to match the going rate of profit, neo-liberals strive to regulate with a light touch even if it they have to sabotage their own market-fixes. Daly, however, should not be condemned simply because he borrows from neo-liberalism, for one can always be inspired by hostile intellectual currents. After all, the neo-liberals have frequently borrowed from Marxists. However, intellectual translations should always be carried out with a consciousness of the context in which those ideas emerged, and those ideas put to use in a way that prevents the replication of hostile assumptions.

Malthusians and neo-liberals

If Daly's employment of neo-liberal concepts was neither overt nor reflective, Malthusianism has always been integral to his *Weltanschauung*. In this regard, he was typical of his generation, for the English parson's bleak political economy became massively popular in the post-war era. Malthusianism offered intellectuals a discourse to link their despair over nature's plight to their latent dread of decolonization. Yet, it was biologists rather than economists like Daly who spear-headed the revival of Malthusianism. Early landmarks included Fairfield Osborn's *Our Plundered Planet* (1948) and William Vogt's *Road to Survival* (1948). Its breakthrough properly arrived a generation later in the late 1960s and early 1970s, when the Keynesian order was creaking under the strains of the Vietnam War and a myriad of environmental crises.

No one represented the Malthusian avant-garde better than the entomologist Paul Ehrlich. He became a convert to the cause after a trip to India in 1966. As he later recollected, "the streets seemed alive with people. People eating, people watching, people sleeping. People visiting, arguing, and screaming. People thrusting their hands through the taxi window, begging. People defecating and urinating. People clinging to buses. People herding animals. People, people, people, people" (Ehrlich, 1968: 1). Upon his return to the US he lectured widely on overpopulation. David Brower, the dynamic leader of the Sierra Club, attended one of these presentations and was so impressed that he induced Ehrlich to write a book. This became *The Population Bomb* (1968), a book that famously began with the prophecy that "in the 1970s and 1980s hundreds of millions of people will starve to death in spite of any crash programs embarked upon now" (1968: xi). To mitigate the worst, Ehrlich countenanced "compulsion" if voluntary measures failed to control population growth (1968: xii).

Daly too speaks of population growth as the gravest of all environmental problems. His interest in demographics sprang from a Ford Foundation fellowship in Brazil's *Nordeste* early on in his career. During a student strike at his host institution, the Federal University of Ceara, Daly read up on overpopulation and environmentalism. As he later reflected, "In my mind, these

three things – Georgescu[-Roegen]'s understanding of entropy and economics, Brazilian society and [Rachel] Carson's ecology – started to cohere" (2018: 85). This intellectual chemistry led to his 1968 article in the *Journal of Political Economy* and the future trajectory of his life's work. In 1970, he argued that development economics required a 'change of emphasis' that elevated population policy (1970: 537). He referred to the growing population of the *Nordeste* as "this swelling" that was building up to "an ecological explosion" (1970: 539). Economists needed tools to control demography so they could treat it as another "variable in the development effort," rather than as a "semisacred [*sic*] constant of nature" (1970: 539). He thought the contemporary Left had little to offer, decrying how "collectivists are more interested in the total, and one more individual usually adds to total power, in the sense of increasing the herd" (1970: 559).

To address overpopulation, Daly turned to the trusty instrument of cap-and-trade. The state would give women birth-licences, which they could sell or give to others (Daly, 1974: 19). He credits Kenneth Boulding for the idea, but Boulding claimed to have made the suggestion in jest. Daly, however, was serious then and even now approves of coercion if it is necessary to achieve global population control (Daly, 2018). One only hopes that if such a regimen were ever implemented, it would be as ineffective as cap-and-trade has proven to be for carbon emissions. Counterfeit offsets would be preferable to forced abortions.

In the 1980s the neo-liberals began their offensive against Malthusians like Ehrlich, for the two ideologies were incompatible. This was not because of any aversion to violence, as the neo-liberal support for the Pinochet government made clear. Rather, they opposed the Malthusians' implication that natural scarcity represented a market failure that could only be solved via violence. The neo-liberals' champion in this fight was Julian Simon, an obscure business professor at the University of Illinois. In the pages of *Social Science Quarterly* in 1980 and 1981, Ehrlich and Simon traded barbs and eventually made a wager concerning the price changes of five commodities over ten years. Ehrlich bet that scarcity would drive up prices, while Simon believed the price-system would signal to entrepreneurs to invest in sectors before scarcity became a true constraint, thus keeping prices low. In the fall of 1990, it was clear that Simon won, as the prices for copper, chrome, nickel, tin and tungsten had tumbled by nearly half. The Malthusian wave thus crested and receded, while neo-liberals were at the cusp of their golden age.

It is worth elucidating Simon's framework because it arrested the Malthusians' seemingly ineluctable advance. He created a new branch of neo-liberal environmental thought that would be taken up by others such as Bjørn Lomborg (1998), Stephen Moore (with White, 2016) and countless epigones. Moreover, if one reads Daly's works in the period since this debate it appears that he and the broader community of ecological economists have not learnt their lesson from this defeat. There are three main components to what one can call 'neo-liberal cornucopianism': the distinction between a *resource service* and a *physical resource*; human capital as the 'ultimate resource'; and energy as the 'master resource' that allows the transmutation of one resource into another.

In 1980, Simon published a short essay in *Science* that outlined his programme of cornucopianism. To redefine 'resources' to exclude concerns of scarcity, he argued that "as consumers we are interested in the services we get from the raw materials rather than the raw materials themselves" (1980: 1435). He gave the example of a copper pot: what interests consumers is less the copper itself, but rather "a container which can be put over heat," and therefore "the cost that interests us is the cost of providing the cooking service, rather than the cost of copper" (1980: 1435). It was the price of these services that represented scarcity, not the absolute amount of a natural resource, so as long as the price for such services continued to fall then there was no crisis.

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Simon expanded these arguments the following year in his magnum opus, *The Ultimate Resource* (1981). While Ehrlich and other Malthusians argued that population growth increased pressures on natural resources, Simon counter-intuitively argued that a larger population has historically led to lower costs for natural resources. This is because the 'ultimate resource' was humanity itself and thus more humans quite literally meant more human capital. "From the economic point of view an additional child is like a laying chicken, a cacao tree, a computer factory, or a new house [...] additional persons produce more than they consume in the long run, and natural resources are not an exception" (Simon, 1981: 4). More human capital meant improvements in extracting and transporting resources, leading to lower resource costs over the long-run even after high-quality lodes were depleted. For this reason, Simon contested the distinction geologists made between 'reserves' and 'resources'; that is, between economic and non-economic deposits. He was especially interested in non-conventional fossil fuels for this reason and criticized the US Geological Survey for its overly 'sensitive' definitions of petroleum. "If one also includes oil that can be forced to the surface under pressure [enhanced oil recovery, EOR], plus naturally non-liquid oil in shale and tar sands and other sources, the estimate would be considerably greater" (1981: 106). Once the boundary between reserves and resources is thus collapsed, nature's bounty appeared limitless.

If human capital was the 'ultimate resource', Simon reasoned, then energy was the 'master resource' for it "enables us to convert one material into another" (1981: 91). Following this insight, he leapt to its logical terminus that capitalism would lead to the complete abstraction of nature. "We and our descendants can manipulate the elements in such fashion that we can have all the raw materials that we desire at prices ever smaller relative to other goods and to our total incomes" (Simon, 1998: 67). Thus, there was no point in speaking of nature as an array of particular physical things. Instead, all that existed were 'elements' that could be recombined given the dictates of the market. In the future everything would be synthetic, as the initial endowment of nature would be integrated, transformed and destroyed by commodification, creating a new second nature. The future era of molecular capitalism would be predicated on ever greater consumption of energy. "As natural scientists continue to learn more about the transformation of materials from one form to another with the aid of energy, then energy will be even more important" (Simon, 1981: 91). All of this required energy prices to remain low because "if the cost of usable energy is low enough, all other important resources can be made plentiful" (Simon, 1981: 91). Simon did not put his faith in cheap renewables or a *deus ex machina* like cold fusion but in limitless non-conventional fossil fuels. This cornucopianism helps to explain why neo-liberals have been so loath to abandon fossil fuels, and why they would eventually put their faith in geo-engineering to ensure an endless horizon for hydrocarbons.

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Of course, Malthusians did not leave Simon's arguments uncontested. Ehrlich with his co-authors responded to Simon's initial 1980 article in *Science*, and they were especially flabbergasted by his argument for modern alchemy. Simon's comment that "copper can be made from other metals" was met by howls of derision. "Indeed! Perhaps Simon here has in mind the technique of elemental transformation by bombardment with subatomic particles in accelerators," sneered Ehrlich, his wife Anne and their protégé John Holdren. "Producing microgram quantities of copper by this means would be a gargantuan feat. Any implication that production in industrial quantities might be economically or energetically feasible is preposterous" (Holdren *et al.*, 1980: 1298–9). Simon's arguments may have been crude, but they had greater efficacy than the Ehrlichs and Holdren ascribed to them. Making copper from scratch may be difficult, but turning bitumen into petroleum was feasible and this process engendered an entirely new branch of the non-conventional

hydrocarbon industry to emerge in the north-west reaches of the Canadian boreal forest.

Another example from their debate over scarcity concerned the global fishing industry. In an exchange between Paul Ehrlich and Simon in 1981 in *Social Science Quarterly*, they discussed recent trends in fish landings. Ehrlich argued (1981) that fish stocks were declining, while Simon disagreed (1982). It turned out that Ehrlich was right, and that world fish stocks were on the cusp of numerous collapses, none more ominous than the destruction of what had seemed to be the limitless cod fishery of the Grand Banks. However, making a Simonian argument that he himself did not make at the time, one could counter that it is the service from fish that matters – that is, fish flesh – not the particular pelagic fish themselves. Thus, fish stocks could collapse, but as long as substitutes from aquaculture took their place and prices for meat remained low, then there was no crisis. Thus, even though Ehrlich and fellow Malthusians have been correct in many of their predictions, they lost the argument to the neo-liberals in a practical sense. If society appraises nature via the market, then too often the destruction of rare minerals or animals leave barely a wrinkle in prices as substitutes take their place (Hanner, 1981).

Although Daly and Ehrlich have collaborated together and indeed work towards many of the same goals, Daly seems not to have registered the damage wrought to ecological economics by the neo-liberal critique. Without mentioning Simon directly, Daly argues against the possibility of limitless substitution. "The complementary nature of natural and human-made capital is made obvious," he insists, "by asking what good a saw mill is without a forest; a refinery without petroleum deposits; a fishing boat without populations of fish" (Daly, 2006: 31). The argument that human-made capital cannot complement the deteriorated stock of natural capital is an argument against the feasibility of endless growth. If too many fish are caught, then the "capital of fishing boats and canneries will also be diminished in value" (Daly, 2006: 37). In another example, he presents the limits of substitution as the impossibility of building "the same wooden house with half the timber no matter how many saws and carpenters one tries to substitute" (1995: 51).

This, however, is not how Simon describes substitution. Rather, more scientific, technical and mechanical capital is invested to develop inferior but larger stocks of *natural* capital, be it deep-sea dwellers that are caught and fed to farmed fish, or building upgraders to synthesize bitumen from the Canadian tar sands. No can say how long this process of substitution can go on for, but hard limits to capitalist expansion do not seem to be in the offing any time soon. Moreover, as early as the 1970s neo-liberals recognized that conserving a natural resource to maintain a sustainable harvest (as Daly advocates) makes little economic sense. Instead, one needs to compare the discount rate with the reproduction rate. For example, if one could invest and get a return of ten per cent a year, then it makes economic sense to run down an asset (*e.g.* whales) if the reproductive rate is only five per cent. That is, economic rationality would suggest that one is better off killing all the whales quickly, and then investing the profits elsewhere (Clark, 1973).

The limits of ecological economics

Despite Daly's seemingly limitless ability to publish, the contours of a steady-state society have remained vague. He often uses the metaphor of the Plimsoll line of a ship, suggesting that if neo-classical economics concerns the efficient distribution of goods on a ship, then ecological economics provides insight into its carrying capacity (Daly, 1991). Yet, how this latter figure is determined is never elucidated in his oeuvre. He gives a few potential ways to argue that growth is impossible, but those are not solutions to this problem. For example, a corollary of his views about substitution was that eventually it would lead to 'uneconomic growth' from having

"If society appraises nature via the market, then too often the destruction of rare minerals or animals leave barely a wrinkle in prices as substitutes take their place."

too much human-made capital instead of the natural kind. Yet, this ignores the structural imperative for capitalists to pursue profits despite any costs they might impose on others.

Another potential basis Daly uses to forecast the limits of growth is the 'human appropriation of the total world products of photosynthesis' or Net Primary Production (NPP). Peter Vitousek and his co-authors (1986) devised this measure to convey how much of the natural world is controlled by humans and redirected to their ends. They estimated that the global total of NPP was 25%, but that figure rose to 40% if one looked only at terrestrial life. Daly reasoned that "more than two doublings exceeds 100 per cent [...] the terrestrial figure of 40 per cent is probably more relevant since we are unlikely to substantially increase our take from the oceans," and therefore 'the human scale' could only slightly more than double before taking all NPP (1990: 30). Although he recognized that the total appropriation of NPP was an "ecological impossibility," how much NPP could grow was left unanswered. However, waiting for capital to attempt to subsume all of the Earth's photosynthetic resources is obviously not a good strategy for environmentalists.

Daly argues for a maintenance of the economy's current proportions, what he calls the 'steady state', but it is not clear why this is necessarily ideal. Georgescu-Roegen criticized his student's work on this basis, arguing that according to the logic of the entropy law a steady-state would be impossible to maintain. As non-renewable resources were used up, the economy would contract and eventually cease. Daly's "vision of a blissful world in which both population and capital stock remain constant" was, for Georgescu-Roegen, a "myth of ecological salvation." The "various logical and factual snags" of Daly's vision lay in "some confusion between finite stock and finite flow rate" (Georgescu-Roegen, 1975: 367).

Shrinking the scope of some national economies could be justified on grounds that Daly does not consider. For example, if renewable energy systems were implemented they would take up vast amounts of space due to their low power density (Smil, 2015), and therefore total energy production should decrease. Instead of NPP, Daly could instead consider how much land is necessary to prevent mass extinctions. Plants and animals need wild habitat to survive, and it is remarkably simple to determine the relationship between land and biodiversity. The entomologist EO Wilson (2016) has, for example, called for half the Earth to be protected for other species, which is over three times the amount of protected land that exists today. The land problem presented by renewable energy and the sixth mass extinction provides a useful heuristic for economic policy, but it is never discussed by Daly. This might be because Daly, a guilty-minded omnivore, assumes only humans are capable of consciousness (Daly, 1987; 2018).

Younger generations of ecological economists now should grapple with the questions that have been ignored by Daly. How can the limits of the steady-state be imposed on recalcitrant capitalists? On what basis should one decide the size and scope of a steady-state economy? Is it wise to rely on neo-liberal assumptions like cap-and-trade? What is their response to Simon's critique of Malthusianism? Why do ecological economists continue to embrace Malthusianism despite its latent racism and sexism?

To remedy these problems, ecological economists will first have to take a hard look at neo-liberalism and capitalism to reduce their vulnerability to being co-opted, and to discern the obstacles that prevent the implementation of a radical environmental programme. Moreover, ecological economists must spurn the lure of Malthusianism both on intellectual and political grounds, to build a coalition with a broad Left that supports self-determination and feminism. Ecological economists could do more to cooperate with the more radical factions of the environmental movement that have fought for environmental justice. If the environmental movement wants to win, it will have to be led by workers, radical

"Ecological economists have to take a hard look at neo-liberalism and capitalism to reduce their vulnerability to being co-opted, and to discern the obstacles that prevent the implementation of a radical environmental programme."

intellectuals, animal-rights activists, environmental justice campaigners and the non-white people whose bodies the Malthusians have sought to control. If the environmentalist movement is remade in this way, then an entirely new ecological economics will be needed too. ■

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Elon Musk's electric planet-suicide vehicle: Automobiles, emissions and degrowth

The climate crisis demands immediate and massive cuts in our emissions of greenhouse gases. In turn, this requires a transformation of the global economy – a transformation that would be unprecedented in scale, scope and speed. Such a shift to an ecologically sustainable economy cannot occur under capitalism. As a case study, this article looks at what would be required to meaningfully reduce emissions from road transport. Promoters of 'green capitalism' have claimed that the solution is electric cars powered by renewable energy. However, most of the emissions of an automobile are produced during its manufacture, and the profits of automobile companies are built around planned obsolescence and short lifecycles. The actual solution to minimizing greenhouse gas emissions from the transportation sector – as for the economy as a whole – is a system that is designed on the basis of rational social need rather than corporate profit.

The Intergovernmental Panel on Climate Change (IPCC) special report *Global warming of 1.5°C* (2018) describes the enormous gap between where we are and where we need to be to prevent dangerous levels of global warming. The 2015 Paris Agreement committed industrial nations to reduce their emissions sufficient to keep global temperatures within a 2°C rise over pre-industrial levels. In the final accord, highly vulnerable island nations and faith communities represented at the UN pressed the authors to include the 1.5°C limit as an aspirational target in the final draft of the accord, with 2°C as the backup target.

Soaring emissions over the past five years, rising atmospheric CO_2 concentrations, ice-cap retreats, intensified storms, summer forest fires reaching even above the Arctic circle, and die-offs of the world's coral reefs have all raised concerns about what even a little bit more warming would bring. Parts of the planet including the Arctic and many inland areas have already warmed beyond 1.5°C. California is now on fire much of the year; Australia has just seen historically unprecedented levels of bushfire. The worst hurricanes are twice as severe (more precipitation, slower passage, greater wind speeds) than they used to be. This is just the beginning of the banquet of consequences that humanity has prepared for itself and the more-than-human world.

Climate breakdown occurring much more quickly than expected is one reason why climate scientists now think that the goal just five years ago of limiting warming to 2°C "increasingly seems disastrous in this context" (Mooney and Dennis, 2018). The Paris pledges were never sufficient even to keep warming below 3°C, let alone 2°C. In any case, few of the signatories have even managed to meet the low bars they set for themselves, and the world's largest countries – including China, the US and Canada – have us on track to a 4–5°C warming. As CO_2 concentrations continue growing, preventing runaway warming is going to require ever deeper, truly draconian cuts in emissions, which will mean greater economic disruption. IPCC estimates already show us needing to achieve a near vertical drop in emissions in this decade. Every day we delay getting off of fossil fuels increases the probability that we will not be able to save the planet's ecosystems.

The 2018 IPCC special report painted a stark portrait of how quickly the world is heating up and called on governments to take *immediate* steps to suppress

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emissions. It argues that in order to prevent temperatures from rising beyond 1.5°C above preindustrial levels, anthropogenic CO_2 emissions must decline by around 45% worldwide from 2010 levels by 2030, and by 100% by 2050. As the report remarks (IPCC, 2018), such a huge reduction in global emissions,

> would require rapid and far-reaching transitions in energy, land, urban and infrastructure (including transport and buildings), and industrial systems. [...] These systems transitions are unprecedented in terms of scale [...] and imply deep emissions reductions in all sectors, a wide portfolio of mitigation options and a significant upscaling of investments in those options.

"Preventing ecological collapse thus requires transforming the world economy at a speed and scale that 'has no documented historic precedent.'"

Preventing ecological collapse thus requires transforming the world economy at a speed and scale that "has no documented historic precedent" (Mooney and Dennis, 2018). In the words of Myles Allen, Oxford University climate scientist and one of the authors of the IPCC report, "we need to reverse emissions trends and turn the world economy on a dime" (quoted in Davenport [2018]). Drew Shindell of Duke University, another author of the report, similarly remarked that the "monumental shift toward decarbonization" that is demanded, "would really be an unprecedented rate and magnitude of change" (quoted in Mooney and Dennis [2018]).

Capitalism prioritizes growth and profits over people and planet

Given this unprecedented existential crisis, one might expect that governments would respond with emergency plans to prevent ecological collapse – bold proposals for "deep emissions reductions in all sectors," for "far-reaching transitions in energy, land, infrastructure, and manufacturing" and so on. After all, the 2018 IPCC report makes clear that on present trends we could – well within the lifetime of many leaders today and certainly their and our children's – be facing the collapse of agriculture in much of the US, India, China and Africa, along with mass famine, submerging coastal cities, widespread species extinctions, destruction of the world's last forests and worse.

What is more, the solution to our climate crisis is astonishingly simple and does not require any new technological breakthroughs. The first step is simply *to stop doing what we're doing*: immediately begin shutting down fossil fuel production, stop new drilling, stop producing and registering fossil fuel powered vehicles, drastically curb air travel, ration fossil fuels, curtail manufacturing and construction. The second step is to force through an immediate transition to renewable energy across the economy (and do what we can to enable this transition around the world).

Yet we hear no bold proposals to meet the challenge from any governments – not from European socialist parties, not from Canadians or Australians (the leading exporters of the world's dirtiest fuels), certainly not from the Chinese (the world's largest polluters who, moreover, are now abandoning the limits on coal-burning they just imposed last year in order to restore growth in the face of the trade war [Cai, 2018]), let alone from the Trump administration. Trump's response to his own government's prediction of a 4°C warming by 2100 is 'the planet's fate is sealed' so we may as well abandon Obama's federal fuel-economy standards for cars and light trucks, and 'burn baby burn' (Eilperin *et al.*, 2018). To the extent we hear any proposals at all from governments, it is just renewed calls for more of the same carbon taxes and the same fantasy tech fixes like 'carbon capture and storage' that have so manifestly failed to staunch emissions to date (Snyder and Drajem, 2015).

Why is that? The reason why no government dares take the obvious steps to save the planet is because no one has come up with a magic fix to suppress emissions without simultaneously suppressing economic growth and profits. Given capitalism, economic growth and profit maximization must be systematically prioritized over all other considerations including emissions reduction – for

otherwise companies will fail, the economy will collapse and mass unemployment will be the result (Smith, 2016a). Global warming may kill us in the long run but economic collapse will kill us in the short run. This is the ultimate contradiction of capitalism: We have to destroy our children's tomorrows – along with much of the Earth's ecosystems – in order to hang onto our jobs today.

That is why from the very first climate negotiations around the Kyoto Protocol in the 1990s, all efforts to contain emissions have been subordinated to maintaining economic growth. Year after year, decade after decade, for 25 straight years to COP 24 at Katowice in December 2019, the Framework Convention on Climate Change (UNFCC) annual summit negotiations invariably collapsed in failure and acrimony. Despite the pleas of climate scientists, desperate submerging Pacific Islanders, Africans, Indians and others who contribute few emissions but suffer disproportionately from global warming induced drought and crop failures, no industrial nation has been willing to accept binding emissions limits because they all understand that such caps would suppress economic growth. As George Bush Sr infamously told the 1992 Climate summit, "The American way of life is not negotiable." And if the US will not accept binding emissions caps, why should China?

Facing growing protests over their do-nothing annual summits, the only thing negotiators at Paris could agree on was to stop holding their embarrassing annual farces (henceforth they agreed to meet every five years instead) and contrive another 'agreement' in which industrial countries pledged to reduce their emissions somewhat, some day but are under no legal obligation to do so. This prompted James Hansen, the world's foremost climate scientist, to complain that:[1]

> It's a fraud really, a fake. It's just bullshit for them to say: "We'll have a 2°C warming target and then try to do a little better every five years." It's just worthless words. There is no action, just promises. As long as fossil fuels appear to be the cheapest fuels out there, they will continue to be burned.

Halting global warming requires degrowth: Substantial de-industrialization in the over-industrialized economies

If there is no 'magic' technological fix then phasing out fossil fuel consumption has to mean shutting down – or at minimum, drastically retrenching – companies, beginning with the fossil fuel producers like Peabody Energy, Exxon Mobil, BP and Chevron. However, this must continue down the petrochemical food chain through to all the fossil fuel dependent industries.

Environmental groups have tended to focus too narrowly on fossil fuel producers, their pipelines and such, while ignoring the downstream industrial and personal consumers. This can be seen, for example, in claims that a mere 100 fossil fuel producing companies are 'responsible for' 71% of global emissions (Griffin, 2017). Not to put too fine a point on it, but the fossil fuel producers don't burn the oil, the coal and the gas. *We* burn it; we burn it producing, processing, transporting and refrigerating food, driving our cars, building, heating and cooling our homes, manufacturing this and that, jetting off on vacations, and so on. Fossil fuels are all pervasive. Using the US as our example of a 'developed' economy, percentages of total greenhouse gas emissions by economic sector in 2017 were as follows (US Environmental Protection Agency, 2019):

- transportation, 29%;
- electricity generation, 28%;
- industry, 22%;
- commercial and residential, 12%;
- agriculture, 9%.

If governments in the industrialized economies had listened to climate scientists in the 1980s and taken steps then to radically suppress emissions, perhaps we would not be in the desperate fix we find ourselves in today. But they didn't. They dithered, stalled, insisted on 'market solutions' that were, in reality, designed to fail – with the result that now, after decades of 'green capitalism,' we find ourselves facing an existential crisis that admits of only one proximate solution: state intervention to

"Now, after decades of 'green capitalism,' we find ourselves facing an existential crisis."

slam the brakes on emissions by shutting down the emitters. If we are serious about suppressing fossil fuel emissions, then we have no option but to drastically retrench and in some cases completely shut down thousands of downstream fossil fuel dependent companies in transportation, petrochemicals and plastics, manufacturing, construction, agribusiness, tourism and more in the US alone. In cases like plastics, disposable products and others, we would have to virtually abolish entire industries, because there is simply no other way to suppress their emissions and make them sustainable.

"The bulk of all the pollution produced over the life cycle of any vehicle, petrol or electric-powered, is generated *before it leaves the showroom*, in the production of the car."

Transportation is now the leading source of CO_2 emissions in the US

As shown in the table above, in 2017 transport was the source of nearly a third of greenhouse gas emissions in the US – having overtaken power generation for the top spot in 2016. In turn, road transport accounts for the largest share of these emissions: 82% in total, comprising 59% from light-duty vehicles, and 23% from medium- and heavy-duty trucks (US Environmental Protection Agency, 2019).

Tesla car charging points at Sindlesham, UK, underwater owing to heavy winter rain (photo: Phil Creighton, Editor of *The Wokingham Paper*; see https://is.gd/teslaflood for more).

Auto emissions are surging despite the advent of all-electric and hybrid cars, because electric-car sales comprise such a tiny share of the total market (2.1% of US sales in 2018 [Irle, 2019]), petrol-powered auto sales are surging, and especially because of the industry and consumer preference for enormous, petrol-guzzling 'sports utility vehicles' and 'light' trucks (which can weigh 2–3 tons) which have become the biggest selling automobiles in the US today (Condliffe, 2016; Ferris, 2018).

The electric car: A solution to what?

Environmentalists who subscribe to the idea that capitalism can be made 'green,' such as Bill McKibben, think the solution to reducing emissions from the transportation sector is simply to replace fossil fuel powered cars with cars powered by electricity generated from renewable sources, such as solar and wind (McKibben, 2016). It is worth examining this suggestion more closely, as a case study of how 'green' technological innovations are not sufficient, so long as we remain within a capitalist framework.

There is, no doubt, a place for electric cars in a genuinely ecologically sustainable society, but this is not *the* solution to reducing emissions from transportation. Why? First, because the bulk of all the pollution produced over the life cycle of any vehicle, petrol or electric-powered, is generated *before it leaves the showroom*, in the production of the car (the extraction and transport of raw materials, the steel, aluminium, rubber, plastics, fabrics, leather, adhesives, electronic components and so on that go into the car, the manufacturing process itself) and in the final disposal of the car. Cradle to grave studies show that petrol-powered cars emit more than 50% of their pollution before they ever hit the road, and a further 4% after they are junked (*e.g.* Nealer et al., 2015).

It turns out that the production of electric cars is even more polluting than the production of petrol-powered cars – a lot more. Take Elon Musk's Tesla S which he touts as a 'zero emission vehicle.' That's false advertising. The Tesla S could emit

zero CO_2 emissions during its 'driving' life phase if it were always charged with 100% renewable energy – virtually impossible in the US, where the national grid is still on average 65% powered by fossil fuels and likely to remain so for decades to come. But even if it were 100% solar or wind powered, when emissions from the Tesla's production and disposal phases are taken into account, it would be more accurately described as a '50% lower emissions vehicle' – at best.

In a life-cycle comparison of greenhouse gas emissions from electric versus petrol cars, the Union of Concerned Scientists found that battery-powered electric vehicles release significantly more emissions (15% more for a mid-size Nissan Leaf, 68% more for the full-size Tesla S) during their production phase than comparable petrol vehicles, mostly due to materials and fabrication of the lithium-ion batteries (Nealer *et al.*, 2015: 3, 5). The study still concludes that, from cradle to grave, electric vehicles produce around 47–9% of greenhouse gas emissions of comparable petrol powered vehicles. So electric cars are cleaner by half, but nowhere near zero emissions.

Furthermore, because of their batteries electric cars typically weigh 25% more than comparably-sized petrol-powered cars. For example, with its 500-kg 85 kWh battery, the full-size luxury Tesla Model S weighs around 2.2 tons, nearly 700 kg heavier than a comparable petrol-powered Cadillac CT6 or Mercedes-Benz C300. To compensate somewhat for the battery weight, Tesla uses aluminium for the body and chassis of the car. But aluminium smelting is extremely energy intensive. Australia's leading public research agency, the Commonwealth Scientific and Industrial Research Organization (CSIRO), calculates that "the embodied energy (all the energy used to make the material) for aluminium is 211 GJ per tonne, compared to 22.7 GJ per tonne for steel" – and thus the "joke description of aluminium as 'congealed electricity' is never far away" (Brooks, 2012).

So if producing the aluminium body and chassis requires roughly, by weight, ten times more energy (and thus produces ten times more CO_2 emissions) than producing the steel body of a Cadillac or Mercedes-Benz, and then you consume 25% more energy (from our still mainly fossil fuel-powered grid) to drive your 2.2-ton Tesla S a few kilometres to work or pick up some bags of groceries at the mall than if you drove a lighter-weight petrol-powered car, how 'green' is that? How much emissions, if any, are you really saving? And that is just the Model S sedan. The Tesla Model X SUV is so obese – weighing more than 3 tons –that it's actually *illegal to drive over the Brooklyn Bridge* (Alter, 2016; Courtney, 2016). Who knew that Americans would one day be driving passenger cars that weigh three tons or more?

Given the foregoing it is difficult to see how replacing the US fleet of half a billion fossil-fuel powered cars with half a billion somewhat-less-polluting electric cars, is going to save the world.

My own vote for the title of 'The World's Most Ecological Car' goes instead to the 1953 (or thereabouts) Chevrolet Bel Air I once saw driving on the streets of Havana, Cuba. These Chevrolets got about 19 L per 100 km – a fuel efficiency slightly better, actually, than the 2018 Chevy Impala, rated at 20 L per 100 km for city driving (figures from https://is.gd/4MGRUv). Note also that the 1953 Chevy weighed just 1.6 tons compared to the Tesla S's 2.2 tons. But the fuel efficiency is not so important. What is important is that this car has a massively smaller carbon footprint than any Tesla or Prius or Volt *because it was only produced once and Cubans have been (rather stylishly) driving it for 65 years*. Since the US imposed its blockade on Cuba in 1962, we *Norte Americanos* have gone through six to eight cars – with all the pollution entailed by their production and disposal – while the Cubans have thriftily and ecologically repaired those old cars and kept them on the road; not their own choice to be sure, but nonetheless.

If the bulk of CO_2 emissions from cars are produced before the car leaves the showroom then, obviously, the best way to suppress vehicle emissions is to produce as few cars as possible and make each of them last as long as possible. But of course that

"It is difficult to see how replacing the US fleet of half a billion fossil-fuel powered cars with half a billion somewhat-less-polluting electric cars, is going to save the world."

runs directly opposite to the needs of the capitalist auto industry which must seek to maximize sales by driving repetitive consumption – the faster the cycle, the higher the profits.

Planned obsolescence: The underappreciated main driver of vehicle CO_2 emissions

Like most other markets for consumer goods, ever since the 1920s the auto industry has been based on designed-in and advertising-driven obsolescence, as the industry ritually pushed 'new' but trivially different models each year. Detroit's Holy Grail was to get you to trade in your 'old' car every year. They used to focus on style – grills and tailfins – and of course they have always pushed the biggest 'fully loaded' models like the ponderous Cadillac Escalades and Lincoln Navigator barges one sees all over my home town of New York City. As the industry phrase puts it: 'big car, big profit; small car, small profit.'

"Like most other markets for consumer goods, ever since the 1920s the auto industry has been based on designed-in and advertising-driven obsolescence."

Today the industry has ramped up the technology, larding their cars with high-tech features and gadgets: hybrid or all-electric motors, driver assist, rear cameras, dangerously distracting infotainment systems (unsafe at any speed!), radar, automatic braking, computerized suspensions, heated (and massaging) seats, heated steering wheels, and more. Much of this high-tech is rapidly obsolesced, cannot be upgraded, and is prohibitively expensive or impossible to repair. Rapid technological obsolescence and the high cost of repairs is driving consumers to lease cars short-term instead of buying them, and short-term use is, in turn, accelerating the disposal of perfectly good but 'obsolete' vehicles (Fleming, 2017; Sorrel, 2016).

That new Fiat 500e electric car with its 130-km range will be obsolete in a year or two as new models boast much higher figures. Like your perfectly functional iPhone 5 that Apple refuses to upgrade because they would rather you buy the latest model, chances are it will become e-car waste, junked long before it is worn out. The replacement battery for a Tesla S costs US$44,000, more than half the cost of the car (base price: US$75,000). How many people are going to buy a second-hand Tesla that needs a US$44,000 battery – especially when the 2022 model will have double or triple the range? I think it is also a safe bet that Tesla will ensure that that 2022 long range battery won't fit in your 'obsolete' 2018 Tesla. We'll see.

If the shift to electric cars ends up shortening the life cycle of cars, that could drive up resource consumption and CO_2 emissions from automobile production, just like it has done with phones, computers and appliances, instead of reducing it. But, meanwhile, industry consultants McKinsey and Company (2016) cheer on disposable cars, predicting that "technology-driven trends," "shorter lifecycles" and "faster replacement rates" will drive up profits for the automobile industry.

In short, the entire auto industry – electric and gas-powered – is completely unsustainable. We don't need an auto industry that produces tens of millions of new cars every year. What we need is a different transportation system. The actual solution to minimizing greenhouse gas emissions from the transportation sector – as for the economy as a whole — is not technological innovation, *but social and economic transformation.* We need to redesign the entire transportation system on the basis of rational social needs, rather than corporate profit, to minimize resource consumption instead of maximizing it. The only way to suppress emissions from the auto industry is not to leave it to the operation of markets, but via democratically managed 'command and control' (Smith, 2016b): drastically reduce vehicle production, ban the production of needlessly large vehicles, vastly expand many modes of public transit and biking, discourage private ownership of cars and encourage the use of shared vehicles. And to the extent that we need cars, if we are going to conserve resources and minimize pollution we would have to make them small, simple, durable energy-sippers, endlessly rebuildable, easily upgradeable (a good model here being the venerable

VW Beetle [Ross, 2015]). Such radical but necessary changes would demolish Detroit's business plan. But either we save GM, Ford and Tesla for a few decades till we face total ecological collapse, or we save the Earth. Which is it to be?

In short, 'de-growing' so much of the economy, wrenching down and phasing out polluting industries would certainly be "huge" and "unprecedented" shifts. But isn't this exactly the sort of "systems transitions [...] unprecedented in terms of scale" that we need to be making? ■

Notes

1 Quoted in Milman (2015). See also Bawden (2016).

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"The actual solution to minimizing greenhouse gas emissions from the transportation sector is not technological innovation, *but social and economic transformation.*"

Understanding what sustainability is not – and what it is

This paper argues that the policy principle of ecologically sustainable development – first and famously articulated in the Brundtland Report of 1987, *Our Common Future* – is an impossible principle. As a guiding principle, it demands that we must simultaneously maximize three different things: social justice, ecological sustainability and economic development. However, this is impossible to do. Despite the principle – and the closely associated idea of 'triple bottom line accounting' – being nonsensical, it has been maintained because it serves a number of other ends. It provides psychological comfort, it helps to maintain the *status quo* of business-as-usual neoliberal capitalism and it provides status-rewarding employment for the professional class. For true ecocentric sustainability on 'spaceship' Earth, we need to reject 'sustainable development' and build an ethically founded eco-socialism.

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After the last 30 years, as soils have continued their catastrophic depletion, the oceans their plastic filled acidification, the biosphere its continued warming, and antibiotic denying superbugs propagate, no-one should be in any doubt: our civilization may not survive the environmental conditions it is in the process of creating for itself. We may argue as to what is the primary driver of our disastrous, potentially catastrophic, environmental impacts – 'human nature,' capitalism, hierarchy, industrialization, patriarchy, anthropocentrism, and so on – and certainly this is a question of the utmost importance. But we may also ask why it is that the *policy principle* that was developed and championed, both locally and globally, as a mean of managing and reducing these impacts has not had any real mitigating effect – indeed, arguably, has had exactly the opposite effect.

This internationally recognized principle – presented first in the Brundtland Report (World Commission on Environment and Development [WCED], 1987) as "a central guiding principle for the United Nations, Governments and private institutions, organizations and enterprises" (United Nations, 1987) – is that of *Sustainable Development* (SD), or, as is sometimes preferred, *Ecologically Sustainable Development* (ESD).

The argument

In what follows we shall argue that (E)SD is, as a policy principle, an *impossible* one. This is not because it sets the bar too high, or asks too much of us. For, in itself, it asks us nothing – and it asks us nothing precisely because it is a *nonsensical* principle. If the principle is defended with the claim it has not really been understood, implemented and followed, we argue in response that it *cannot* be understood, implemented and followed in the first place.

To make our case we must, naturally, explain how it has come about that (E)SD has been presented as such a policy principle and for so long, for irrationality cannot explain itself. Why, and for whom, is an impossible policy principle useful (even essential)? What forces and interests have been served and furthered, indeed often created, by such an impossible policy principle? And why is it that the impossibility is not recognized? Answering these questions will throw light on the principal driver of our ecological destructiveness as it grinds onwards, even as the consequences of that destructiveness already surround us. But it will do much more, for it will let us start

to see just what real sustainability might mean, or, rather, what it *must* mean, if it is to shape and inform our lives together for that end.

Introducing (ecologically) sustainable development

The origins of the (E)SD principle lie in the 1970s, and particularly in the response of the United Nations to the emerging idea (and evidence) for the 'limits to growth' thesis – a thesis most fully and forcefully articulated by a body of economists, scientists and system theorists in a report under that title (Meadows *et al.*, 1972). The United Nations' initial response to an emerging reality that, on the face of it, might be taken as impugning the idea of economic growth and development, and so the project of poverty alleviation and elimination in 'developing countries,' came in the very first United Nations Conference on the Human Environment (held in Stockholm, Sweden, in 1972), with this declaration (United Nations, 1972):

> A point has been reached in history when we must shape our actions throughout the world with a more prudent care for their environmental consequences. Through ignorance or indifference we can do massive and irreversible harm to the earthly environment on which our life and well being depend. Conversely, through fuller knowledge and wiser action, we can achieve for ourselves and our posterity a better life in an environment more in keeping with human needs and hopes [...] To defend and improve the human environment for present and future generations has become an imperative goal for mankind.

In the service of this declaration, in 1983 the United Nations commissioned the ex-Prime Minister of Norway, Gro Brundtland, to gather together 22 people (economists, scientists, politicians, diplomats and business people) representing 21 nations, both 'developed' and 'developing,' as members of a World Commission on Economy and Development (soon to be better known as 'The Brundtland Commission'), with the following terms of reference (United Nations, 1983):

1. to propose long-term environmental strategies for achieving sustainable development to the year 2000 and beyond;
2. to recommend ways in which concern for the environment may be translated into greater co-operation among developing countries and between countries at different stages of economic and social development and lead to the achievement of common and mutually supportive objectives which take account of the interrelationships between people, resources, environment and development;
3. to consider ways and means by which the international community can deal more effectively with environmental concerns, in the light of the other recommendations in its report;
4. to help to define shared perceptions of long-term environmental issues and of the appropriate efforts needed to deal successfully with the problems of protecting and enhancing the environment, a long-term agenda for action during the coming decades, and aspirational goals for the world community, taking into account the relevant resolutions of the session of a special character of the Governing Council in 1982.

In 1987 the Brundtland Report appeared. It was entitled *Our Common Future*, and it gave conceptual content to the term 'sustainable development' – a term which had first appeared as a phrase in the International Union for the Conservation of Nature and Natural Resources' *World Conservation Strategy* (1980). *Our Common Future* defined 'sustainable development' (which it often paraphrased as "ecological and economic sustainability") as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987: 43).

What is (E)SD?

Examining this definition, (E)SD would thus seem to involve the following:

"The origins of (E)SD principle lie in the 1970s, and particularly in the response of the United Nations to the 'limits of growth' thesis."

1 a focus on human needs (*development that meets the **needs** of the present without compromising the ability of future generations to meet their own **needs***);
2 the assumption that such needs provision can only be satisfied by continuing 'development' (***development** that meets the needs of the present without compromising the ability of future generations to meet their own needs*);
3 the claim that satisfying present human needs must be – and so (presumably) can be – satisfied in ways that do not undermine or prevent future generations from meeting their needs (*development that meets the needs of the present without compromising the ability of **future generations** to meet their own needs*).

Elaborating on this, we can see that (E)SD involves a core conception of *social justice* – it is a matter of universal, indeed, intergenerational, human needs satisfaction; that it presupposes that adequately meeting such needs is a matter of a *continuing developmental process* (understood, roughly, as "an evolutionary process in which [...] human capacity increase[s] in terms of initiating new structures, coping with problems, adapting to continuous change, and striving purposefully and creatively to attain new goals" [Peet, 1999: 77]), and – though this implication only becomes apparent as the Report develops – that this developmental process is crucially a matter of *economic development* ("economics and ecology must be completely integrated in decision making and lawmaking processes not just to protect the environment, but also to protect and promote development" [WCED, 1987: 37]). In the words of the Commission's Mandate (WCED, 1987: 356):

> The Commission is confident that it is possible to build a future that is more prosperous, more just, and more secure because it rests on policies and practices that serve to expand and sustain the ecological basis of development.

Understood in this way – with ecological sustainability a matter of "the ecological basis of development" – (E)SD may seem to be nothing new. After all, the standard justification of liberal (or, more recently, neo-liberal) economics as morally and socially desirable, and so its role as a 'guiding principle' in all areas of human life, takes pretty much the same form, which we summarize as follows: *It is the economic development engendered by the competitive activities of agents in free markets which allows the continuing and expanding satisfaction of human needs through time.*

Here we have needs, we have economic development, and we have intergenerational justice. Given this, it is not unreasonable to think (E)SD involves nothing more – and nothing less – than the progressive unleashing of the beneficence of the 'invisible hand' of *laissez-faire* across more and more areas of human life – now with ideas like 'natural capital,' 'ecosystem goods and services,' 'carbon markets' and so on.

Of course, the Brundtland Report understood – or presented – (E)SD as something *more* than just an expansionist version of the traditional defence of free markets. Such traditional defences were seen as inadequate in so far as they failed to note, or adequately emphasize, the *mutual dependency* of the economy and the environment in our productive attempts to satisfy human needs. They did not, it was argued, properly take into account ('efficiently price') so-called 'negative externalities.' In the words of the report: "We have in the past been concerned about the impacts of economic growth upon the environment. We are now forced to concern ourselves with the impacts of ecological stress" (WCED, 1987: 5). Still, it is obvious that rectifying this inadequacy is merely to complete the traditional justification of liberal economics, for it furthers the 'efficiency' of market pricing, and does so in pursuit of economic development.

Understood in this way (E)SD assumes its familiar form. Thus (Victor, 2006: 91):

> A healthful environment [...] provides the economy with essential natural resources. A thriving economy, in turn, allows society

"The Brundtland report understood – or presented – (E)SD as something *more* than just an expansionist version of the traditional defence of free markets."

> to invest in environmental protection and avoid injustice such as extreme poverty. And maintaining justice [...] ensures that natural resources are well managed and economic gains allocated fairly.

This formulation captures the three core aspects of (E)SD: the economic, the environmental and the social. And as these three aspects are brought together in the *one* 'guiding principle,' (E)SD becomes a matter of so-called 'triple bottom line accounting.' This idea was first explicitly formulated by John Elkington in 1994 in an article entitled "Towards the sustainable corporation: Win–win–win business strategies for sustainable development"; an article which "look[ed] at the ways in which companies can turn the environment game into one in which they, their customers, and the environment are all winners" (Elkington, 1994: 91).

After all, a guiding principle has to be, first of all, before we do anything, a *principle*. As it is meant to direct our actions, and at the most basic policy level, it must (like any useful signpost) direct us towards a goal. And as that goal is social justice, ecological sustainability *and* economic development, these must come together in the principle. It is, in other words, either 'win–win–win' or no principle at all.

> "Who could honestly reject the promise of a 'win-win-win' situation? Certainly not the United Nations General Assembly."

Who – whichever value most concerned them – could honestly reject the promise of a 'win–win–win' situation? Certainly not the United Nations General Assembly, which endorsed the Brundtland Report, and, among many other organizations and groupings, the International Council for Local Environmental Initiatives (ICLEI), an association of 900 local government jurisdictions in nearly 70 countries, which, in 2007, decided to implement it by endorsing 'triple bottom line' as the standard accounting measure of (E)SD. Most recently, in 2015, the 2030 *Agenda for Sustainable Development* was adopted at the United Nations Sustainable Development Summit with this as its very first line: "This Agenda is a plan of action for people, planet and prosperity" (United Nations, 2015).

Why (E)SD cannot be a guiding principle

If (E)SD as captured by 'triple bottom line accounting' was able to function as the United Nations recommended – that is, as "a central guiding principle for the United Nations, Governments and private institutions, organizations and enterprises" – then there could be no better job than that of 'Sustainability Officer.' After all, this would appear to be a job that no-one (at least, no-one who was rational and morally concerned) could object to, and to be pursuing goals that are mutually satisfying for all. Who could not love such a job, and the general acclamation it would seem to entail? The trouble is that there is no such job on offer, and nor could there be.

The reason that this is – indeed, must be – the case was first pointed out by Von Neumann and Morgenstern in 1953, and reiterated in 1972 by Garrett Hardin in his epochal essay "The Tragedy of the Commons." It is surely surprising (to put the best spin on it), that few in the sustainability development business seem to have noticed. Hardin, when thinking about whether Jeremy Bentham's utilitarian goal of "the greatest good of the greatest number" (a matter of the joint maximization of merely two ends) might be achieved, answered (Hardin, 1972: 1243):

> No [...] It is not mathematically possible to maximize for two (or more) variables at the same time. This was clearly stated by von Neumann and Morgenstern, but the principle is implicit in the theory of partial differential equations, dating back at least to D'Alembert (1717–1783).

The relevant passage in Von Neumann and Morgenstern (1953) appears on p 11 of *The Theory of Games and Economic Behavior*:

> A guiding principle cannot be formulated by the requirement of maximizing two (or more) functions at once. Such a principle, taken literally, is self-contradictory. (In general one function will have no maximum where the other function has.)

While the language may be technical, the point is not. Just as one cannot maximize two different ends at the same time (maximum population and maximum happiness for Hardin), nor can one, even more impossibly, simultaneously maximise all three legs of the triad of (E)SD. It follows from this it is *literally impossible for (E)SD to be a guiding principle*, and so for 'triple bottom line accounting' to amount to anything more than obfuscation.

What is not impossible, of course, is maximizing a single function or a weighted average function. As Von Neumann and Morgenstern (1953: 11) continue: "If some order of importance of these principles, or some weighted average is meant, this should be stated." But it was precisely such a lexical ordering or dependence on a weighted average that (E)SD was supposed to overcome, for neither lexical ordering nor a weighted average can deliver a 'central guiding principle' that promises to deliver a 'win–win–win' outcome. Giving one principle lexical priority means that that principle *always* wins, while any weighted average involves negotiating *trade-offs* between the relevant principles. The first approach *can* give a 'guiding principle for action' – Maximize economic growth! *or* Protect the environment! *or* Pursue social justice! – but it is certainly not (E)SD. The second approach gives only a space for the usual, pre-principle, politics of conflict and negotiation that (E)SD was supposed to transcend.

If (E)SD cannot be a guiding principle, why has it been presented as such?

You might think that an impossible guiding principle – given its impossibility – cannot have a point or function at all, but this is *not* so. Of course, it cannot be what it says or claims to be. But there are many *other* things it might be, and many other things it might be doing. And it might even be the case that it can only be what it is, and do what it does, insofar as it manages to lay claim to do the impossible.

Without any claim to completeness – nor any claim as to their relative importance, or possibilities of com-presence – we can think of the following functional possibilities – all of them compatible, indeed, reinforcing: and so, in this, unfortunately, exactly unlike (E)SD.

In the first place there might be a *psychological* function or point. An impossible guiding principle might offer to those who avow it great psychological relief, just as it may be psychologically comfortable for people generally to believe that there are competent people able to do – indeed, are doing – the impossible... Here moral heroism may take its last empty stand.

True, it would be nice, both for agents and audience – indeed, quite lovely – if (E)SD *was* a guiding principle. If we could maximize economic development *and* poverty alleviation *and* protection of the natural environment, then we should set about doing so, and justifiably feel good about it. The belief, then, that we can do these things promises both the psychological relief of stress reduction and the positive reward of doing three good things all at once and in the same action or process. The psychological attractiveness of this can hardly be underestimated. Indeed, such stress relief and positive reward will be all the greater to the extent that we are haunted by the (repressed) fear of the impossibility of the whole project, and aware of the potentially catastrophic results that acting on the principle is meant (impossibly) to avert.

In the second place, not unrelated, there might be a *social* or *political* function or point. Thus, one function of (E)SD as a guiding principle might lie in its role in holding together three different constituencies in a (here, trilateral) 'process.' The 'as long as they/we are talking' phenomenon might – whatever else might be said (and well said) against it – generally be thought better than fighting; and certainly it will seem so to those whose stake in the *status quo* would be threatened by any open conflict.

In the third place there might be, as it were, various *professional* functions of (E)SD as a guiding principle, and especially for our budding 'Sustainability Officer.' For

"It is *literally impossible for (E)SD to be a guiding principle*, and so for 'triple bottom line accounting' to amount to anything more than obfuscation."

instance, while it is impossible to maximize more than one of the triad, economic growth/environmental protection/social justice, that does not mean that there might not be a *job* in it – indeed, as we saw with our prior psychological and social considerations, one that may present itself as a stress-reducing, status-rewarding job. Naturally, just how much of this is available may depend on whether one is asked to *do* the impossible, or simply to *think* about doing it. Merely thinking about ways to do the impossible means that there is an endlessly empty logical space waiting to be filled by ever new ways of failing, while actually trying to do it, and repeatedly failing, can soon become dispiriting.

(E)SD, then, may, in all its impossibility, ground itself in the psychological, social and political, and professional functions. But why *does* this psychology, personal, political and professional, payoff? What does this impossibility make *possible*?

"There are good reasons for the suspicion that (E)SD serves as ideological cover for the politics and economics of 'business as usual' neoliberalism."

Why economic development dominates (E)SD

As Finger and Chatterjee pointed out in their pioneering 1994 book *The Earth Brokers*, there are good reasons for the suspicion that (E)SD serves as ideological cover for the politics and economics of 'business as usual' neoliberalism: a useful displacement of real concerns and real issues into impossible projects and an equally impossible, because empty, moral heroism that operates entirely on the level of the symbolic, whilst leaving the operations of capital accumulation and market dominance essentially untouched – even strengthened by a 'legitimacy effect.' It would, of course, be unnecessarily cynical to think that it is perceived as so by all those who participate in (E)SD policy deliberations – and certainly for those whose fundamental concern is with the ecological or social justice legs of the triad. But what is true, as we will now show, is that the 'economic development' element of the (E)SD triad is, in present circumstances at least, better equipped than the other legs to assuming that lexical priority a guiding principle demands, and better equipped to strongly dominate any weighted average approach.

In the first place it is better off in a 'technical' sense. The point is a familiar one, even if its impact on (E)SD is not always appreciated. For economics has a language – that of *money* – which is 'universal' in the sense that it can be used to commensurate absolutely everything and anything. Using various technical measures – such as shadow pricing and contingent valuation surveys – anything whatsoever (*ipso facto* anything to do with environmental and social justice matters) can be assigned a money value. Assigning such value(s) gives the appearance that not only is 'triple bottom line accounting' (E)SD possible, it is realizable through the already familiar techniques of Cost–Benefit Analysis.

It may be said, in defence of Cost–Benefit Analysis, that the mere fact of money commensurability does not, of itself, imply that the economic development leg of the (E)SD triad will either lexically squeeze out the other elements, or be strongly dominant in any weighted average, but the fact is that it has a natural and well-nigh unavoidable tendency to do so, and for comprehensible reasons.

In the first place, while shadow pricing and contingent calculation surveys may enable us to assign a money value to environmental and social justice matters, they do so only indirectly and against the background of market determined prices. The values they assign, for all their being specified in money terms, are not determined directly by the operations of the market, but are, instead, *as-if* determinations. They are thus 'soft' with a softness that can only be removed by the 'hardness' or 'rigour' of genuine market determination: that is to say, by being completely swallowed up by the hard monetarism of the economic element of the (E)SD triad. After all, a real dollar is – whatever else we might think of it – worth more than a merely imaginary, *as-if*, dollar.

It is, presumably, just this fact, however vaguely recognized, that leads to the well-known fact that many people simply refuse to participate in contingent valuation

surveys when the topic is a matter of environmental or social justice concerns. They know that the 'technical' devices are in fact substantive on a policy level, even if not in real dollar terms, and that even to posit a money value for something is thereby to invite it to be treated solely as an economic good or harm whose value is whatever the market determines (*cf.* Frey and Pirsher, 2019).

The second reason for thinking the economic element of (E)SD will demand lexical priority or dominate any weighted average lies in the way the 'technical' point points us to the realities of socio-political power. For real, not *as-if*, wealth gives economic power that feeds into, infuses and so delivers social and political power in a way that a concern for social justice or ecological values does not. If the common talk when it comes to (E)SD is of 'stakeholders,' the fact is that some stakeholders are more so than others. For while one meaning of the term is 'someone who has an interest in the success of a plan, system or organization,' the dominant meaning – and the one that explains the rapid rise and proliferation of the term from the 1980s onwards – is 'a person or company that has *invested* in a business and *owns* part of it.' These stakeholders – the ones with real, not notional, dollars – have real, not notional, political power, and so, despite talk of 'triple bottom line' (E)SD accounting, their views invariably carry more weight in policy deliberation and formation than the views of other groups.[1]

The third reason for the lexical priority and domination of the weighted average of the 'development' leg of the triad is that (E)SD – in virtue of its conjoining sustainability and development in terms of "the needs of the present" – indexes sustainability to *present* conditions. This does two, connected, things. First, it tends to an inevitable, presentist (if, often, unconscious) partiality when it comes to needs specification, as well as tying the idea of the "needs of future generations" to that focal specification; and, second, it does so from a context, from a world, in which our needs have already been thoroughly formed and informed by a capitalism that is built on, and so fosters, ever new 'consumer needs.' To the extent, then, that (E)SD implies talking, not fighting, any idea of the need for a radical re-evaluation of human needs, or of the necessity of radical economic revolution, is off the table, and is so from the start.

What should we conclude about (E)SD?

(E)SD is not – and cannot be – a 'guiding principle' as was intended by the Brundtland Report. Rather (E)SD appeals to three distinct goals – economic development/social justice/environmental health – which cannot be simultaneously maximized. It is, therefore, an impossible guiding principle. Of course, the three concerns have underlying practical and functional interdependencies, but such functional interdependencies do not constitute them as a unity. Indeed, if they did, there would be no need for talk of (E)SD in the first place.

So why was (E)SD proposed as a guiding principle, and why has it continued its zombie existence? On the available evidence, and on the most basic and encompassing level, it provides an ideological cover for business-as-usual neoliberal capitalism,[2] it offers psychological relief through wishful thinking, and it offers some the chance or opportunity of a professional placement and career. What it does not do is provide a pathway to sustainability.

What is sustainability really?

If there is no sustainability in (E)SD, that does not mean there is nothing to sustainability. It means, rather, that 'triple bottom line' accounting is nonsense. And it also means, given the situation and place we are in, that any attempt to replace 'triple bottom line' (E)SD with a lexical priority ordering, or weighted average interpretation of (E)SD, will tend (indeed, will tend *irresistibly* as the last 35 years ought to have shown us) to see established – so real, rather than notional – economic power continue on in its established and preferred pathways, even if, tragically, the

"(E)SD is not – and cannot be – a 'guiding principle' as was intended by the Brundtland Report."

end result is foreseeably that of collective disaster.

To avoid such a catastrophe, what must be done when it comes to policy deliberation and determination? How can sustainability be understood and utilized on a collective level so that it does more than simply provide cover for destructive neoliberal capitalism? And, on the personal level, offer more than the empty consolation of a collusion that disguises itself in wishful thinking and purely professional rewards?

It is fortunate that there is a way of doing this, and a way that was first proposed in 1966, long before the Brundtland Commission formalized the impossible nonsense of (E)SD. It was, in fact proposed by an economist – Kenneth Boulding – whose ambition was to 'internalize' both economic and equity concerns into a foundational and basic concern for a conceptually well-formed understanding of sustainability (Boulding, 1966).

"Economics is the economics of sustainability, and the ethical is the ethics of sustainability."

Spaceship Earth sustainability

Boulding argued that making sense of sustainability in such a way that it internalized economic and equity concerns, rather than set them up as separate, and so never fully commensurable in policy deliberation, meant thinking of the Earth system as – in a non-technical sense (for it has, and as a biosphere requires, solar energy inputs) – a *closed* environment, as opposed to that open environment presupposed by traditional economics (Boulding, 1966):

> The closed earth of the future requires economic principles which are somewhat different from those of the open earth of the past. For the sake of picturesqueness, 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 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.

Considered this way, sustainability is both the fundamental concern, and is all encompassing. It is not that everything else (economic and ethical) is subordinated to it, but, rather, that they must be understood in terms of it: economics is the economics of sustainability, and the ethical is the ethics of sustainability.

This means that the most fundamental ethical–economic concern, now indexed not to the merely occurrent – and so 'timeless' – present, but to an endlessly sustainable present, is that of *needs provision*, where such needs are not (as with 'consumer needs') to be further and endlessly added to, but are general and basic. Such needs will include things like breathable air, potable water, adequate shelter and food, fertile soil and adequate genetic stock. These basic material needs will not, of course, be all the needs in play, for there are needs of humanity and sociability (needs for contact and companionship, for security and a level of novelty, for meaningful activity and recreation) though, again, these needs are superstructural on the materially basic needs and their continual sustainable provision.[3]

In a "spaceman economy" (and in a way that helps us to see further what sustainable needs provision implies) what is crucial is not, as it is for us today, Gross National Product, but *stock maintenance.* Boulding (1966) puts it this way:

> In the cowboy economy, consumption is regarded as a good thing and production likewise; and the success of the economy is measured by the amount of the throughput from the "factors of production," a part of which, at any rate, is extracted from the reservoirs of raw materials and noneconomic objects, and another part of which is output into the reservoirs of pollution [...] By contrast, in the spaceman

> economy, throughput is by no means a desideratum, and is indeed to be regarded as something to be minimized rather than maximized. The essential measure of the success of the economy is not production and consumption at all, but the nature, extent, quality, and complexity of the total capital stock, including in this the state of the human bodies and minds included in the system. In the spaceman economy, what we are primarily concerned with is stock maintenance.

Understanding sustainability in terms of stock maintenance means, of course, that what we are presently engaged in (and what (E)SD was meant to allow to continue its 'development') is manifestly not sustainable, but disastrously unsustainable. Thus, we have our first imperative: move from unsustainability to spaceship sustainability. An imperative that includes (for it must) questions of a sustainable population size in the context of enduring needs provision.

Basic needs and sustainability

If Boulding's understanding of sustainability is to be properly appreciated, and the temptation to read things like 'stock maintenance' in a standardly economistic way avoided, it is important to see that his understanding of needs has two connected dimensions, both of which bring out the way 'spaceship Earth' thinking and 'ecocentric' thinking ultimately converge in 'spaceman' economics.

The first dimension is that the basic needs in question are *holistically* determined by our place and history in the biospherical 'spaceship' on which we now live, for they have arisen as essential to our being through the "play" of natural selection in the encompassing ecological "theatre" (Hutchinson, 1965). As such they are constitutive of what we might call our 'species being,' where that being is – as ecocentrism argues – *relational*, and all the way down.

The second dimension follows from the first. For our basic needs are relational in two intertwined ways – to the wider ecological theatre itself, but also to our fellow species members as a naturally selected reproductive unit ('species') in that theatre. It follows from this that needs *provision* is a matter both of what 'stock' is available and of how we together (as a group, as a species) go about drawing on this stock. This means, as a matter of praxis, that *genuine sustainability is a matter of mutually realizing holistically determined basic needs*. It is this 'mutual realization' condition that allows us to develop – as Boulding in his essay does not develop – an understanding of the *politics* of genuine sustainability.

The politics of sustainability

The politics of sustainability, and so of basic needs provision, is not something unfamiliar or novel – however unfashionable, even impossible, it may be in a 'cowboy economy.' It embodies an essential, because constitutive (so 'eternal') conception of social justice. Indeed, a conception of social justice that has a long pedigree, for it can be discerned in traditional hunter–gatherer communities and social commons regimes of the kind Elinor Ostrom (1990) studied, though she herself never seems to have clearly drawn the conclusion. Social justice in a sustainable 'spaceship' is a matter of *from each according to ability, to each according to need*. This formula is, of course, one that characterizes *socialism*, both 'Utopian' and 'Scientific.' And it does something that is not done – indeed, arguably, could never be done – with any conception of justice that is grounded in individual *rights*, for it internally connects needs and obligations in a relational and holistic way that the latter, with its individualistic focus, cannot do.

A modest proposal

Considered as a 'spaceship,' and so, as a sustainable, economy – where this means simply an economy that sustainably meets relationally constituted basic human needs – there is no real dispute, given our circumstances, as to the general policy framework implied. As one of the most

"Social justice in a sustainable 'spaceship' is a matter of *from each according to ability, to each according to need.*"

important writers in the post-Boulding tradition, the Chinese economist and world systems theorist, Minqi Li (2008), neatly summarizes:

> The technical requirements for climate stabilization are clear. The global energy infrastructure needs to be fundamentally transformed to be based on renewables. Much of the world's economic infrastructure will have to be changed accordingly. Agriculture will need to be reorganized to follow sustainable principles and to be freed from dependence on fossil fuels for fertilizers and machineries. The entire transportation system will have to be re-built, with railways and public transportation operated by renewable electricity playing prominent roles. The scale of the world economy will need to be reduced in accordance with the emissions reduction objectives. All of these need to be accomplished without undermining the basic needs of the world's population.

"Let us – for there is no sustainable alternative – build for ourselves a socialism that internally connects holistically conceived basic human needs and obligations."

As we have seen, the only way that this might even conceivably be done requires a conception of sustainability that internalizes ecology and economics into a universal understanding of holistically conceived, and so relationally constituted, basic human needs. This is not something (E)SD can do, claiming, as it does, that economic developmentalism and social justice and ecological sustainability are different 'functions' that can be jointly realized. It is, however, something that can be done in terms of that socialist justice of 'from each according to ability, to each according to need.'

It is, perhaps, the last, 'socialist,' requirement for real sustainability that leads so many of us today – and pretty much everyone of the elite capitalist class, and the upper middle classes of "university professors, engineers, technicians, managers, financial analysts, and other professionals" (Li, 2008) that make up the majority of those who form the mainstream environmental movement – to commit not to real sustainability, but to the impossible variety that may deliver (especially to these people) psychological easement, moral self-regard, and a job, and so to the inevitable catastrophic consequences of (E)SD.

And so our modest proposal: given that (E)SD is an impossibility as a guiding principle, and that it is an impossibility capitalism demands, let us – for there is no sustainable alternative – build for ourselves a socialism that internally connects holistically conceived basic human needs and obligations. There is no other way when it comes to real sustainability. And one thing we can be sure of, and that may support us in our project, is that, unlike (E)SD, this project is not impossible from the start. ■

Notes

1 None of this is surprising, given that stakeholder theory arose as a theory of the firm in capitalism. As one popular presentation has it, "Stakeholder theory [...] stresses the interconnected relationships between a business, its customers, suppliers, employees, investors, communities and others who have a stake in the organization" (http://stakeholdertheory.org/).

2 Indeed, by appearing to reconcile ecological sustainability and business or economic development, it tends to deepen the hold of the latter insofar as it encourages scholars, policymakers, and, of course business leaders, to look favourably on the idea of so-called 'public-private partnerships' – an idea and approach institutionalized in (E)SD at the World Summit on Sustainable Development in 2002.

3 Nor do these needs of humanity and sociability imply, as is intimated in the Brundtland Report ("Sustainable development requires meeting the basic needs of all and extending to all the opportunity to satisfy their aspirations for a better life" [WCED, 1987: 44]) – that every generation has a need for an ever increasing 'standard of living.' What is sought, as Boulding says, is not this, but "quality of life." And there is no reason to think this demands ever more 'development.'

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Green republican political economy: Towards the liberation from economic growth and work as disutility

This article focuses on green non-ecological critiques of orthodox economic growth and offers a distinctive green republican political economy argument in favour of democratizing production as part of the 'just transition' to a sustainable, regenerative economy. Democratizing production could, by enabling the realization of some of the internal goods of work, reduce ecologically damaging orthodox economic growth. The article then proceeds to critically analyse the dominant conception of 'work as disutility' within both the history of modern political economy and more importantly within neoclassical economics. This (mis)conception of work is one that neglects to recognize the internal values of work, and frames a view of human labour which is used to justify despotic workplace management practices. Hence liberating the macro economy from the imperative of endless growth, and at the micro economic/workplace level liberating production from capitalist productivity, could simultaneously enhance human freedom and flourishing *and* ecological sustainability.

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> "Who, in the light of biophysical reality, can remain committed to the growth-forever vision? Apparently, our decision-making elites can. [...] Their commitment is not to maximize the cumulative number of people ever to live at a sufficient standard of consumption for a good life for all. Rather, it is to maximize the standard of resource consumption for a small minority of the present generation, and let the costs fall on the poor, the future and other species."
> Daly (2013: 4–5)

One of the key and long-standing concerns of green politics and green political economy has been around 'limits to growth'. While initially based on the ecological impossibility of endless orthodox (GDP) growth as a permanent feature of the human economy (Barry, 2016; 2018) – impossible to extend infinitely into the future or extend to the world's population as a whole – green critiques of growth also have non-ecological dimensions. These include concerns about the link between growth and inequality (within and between nations), the lack of connection (after a threshold) between human flourishing and continuing growth, and concerns around the negative impacts of the growth imperative on democratic politics and the further spread of democratic norms throughout society and the economy (Barry, 2012).

This article will focus on some of these non-ecological critiques of economic growth (and related ideas and practices of competiveness, productivity, efficiency and maximization) and offer a green political economy argument in favour of democratizing production. It also argues that from an ecological sustainability perspective, democratizing workplaces and production could, by enabling the realization of some of the internal goods of work, reduce ecologically damaging orthodox economic growth. That is, the creation of a regenerative economy requires the democratization of work, and attention towards its specifically *internal* values and goods when, following MacIntyre for example, it is viewed as a *human practice* as opposed to an *institution* (Barry, 2013). These internal goods, comprising, *inter alia*, creativity, autonomy and democratic decision-making, could, by constituting practices adding to human flourishing, decouple the sphere of production from being 'locked into' endless ecocidal

economic growth. A key issue here is to distinguish formally paid employment from work, and the article discusses how dominant growth-oriented measures of the economy only focus on employment and exclude and normatively disvalue unpaid work.

The article then proceeds to critically analyse the dominant conception of 'work as disutility' within both the history of modern political economy and more importantly within neoclassical economics. This (mis)conception of work is one that both neglects to recognize the internal values of work, and frames a 'productivist and growth' oriented view of human labour which is used to justify 'despotic' workplace management practices. Here the article canvasses arguments for viewing modern employment as a form of 'wage slavery,' and why from a green republican perspective we should be concerned about it, and supportive of attempts to reduce the undemocratic unfreedoms of this condition. Of interest here from a green republican political economy point of view is that the main justification used for maintaining (and extending) workplace dictatorships and denying democracy in the workplace is efficiency and the maximization of production. In a word, *growth*. The main argument presented here is that if work is an undesirable activity, this may be because of how production is organized, who controls it and how the benefits from it are distributed, not because of work *per se*. One needs to look therefore at how work and employment are organized and structured.

From an ecological sustainability point of view, democratizing work – which may reduce productivity – is, *ceteris paribus*, a positive policy option in that it can reduce negative impacts of economic activity and increase democratic decision-making within the sphere of production, as well as expand individual autonomy and creativity within that sphere. Democratizing employment and recognizing work, including re-orientating public policy away from a dominant focus on employment (and hence economic growth), allows for the possibility of 'post-growth' political economic objectives such as reducing the length of the working week, and shifting from wage-based private consumption to both lower consumption and forms of collective and shared consumption.

Green political economy and consumption

"Advertising has us chasing cars and clothes, working jobs we hate so we can buy shit we don't need."
Fight Club (1999 film)

Do good human lives have to cost the Earth? Can we have high quality lives with low carbon and low environmental impacts? These are some of the complex questions we need to ask in the 21st century, the 'age of the Anthropocene,' accelerating climate breakdown and exacerbating inequalities within and between societies. Providing answers and political/policy solutions – or, more likely, 'coping mechanisms' (Barry, 1999) – to these interlinked questions in the turbulent times ahead will (even if as yet we cannot see the urgency) dominate or at the very least profoundly frame and shape politics, economics and culture in the decades ahead – from the local to the global scale. Or, at least, we should *hope* that addressing the existential crisis facing life on this planet does dominate and frame human political thinking and acting, since if this does not happen, then the outlook is grim for future generations of the human and more than human worlds.

A key focus for understanding and navigating a way through a climate changed and carbon constrained world has to be *political economy* (not be confused with its contemporary bastard offspring, 'economics'), and *green* political economy in particular. On the one hand, green political economy calls attention to the metabolism between the human economy and the much larger ecosystem and biophysical processes and systems on which it depends. That is, a green political economy focus draws – or should draw – our attention to the non-human energy and resource inputs and pollution *etc.* (including nonhuman agency) that is required, produced, transformed,

"Green political economy calls attention to the metabolism between the human economy and the much larger ecosystem and biophysical processes and systems on which it depends."

etc. as a result of human economic activities. Moreover, green political economy – like other critical forms of political economy, such as those drawn from Marxist, post-colonial or feminist thought – foregrounds human relations of power, ownership and control of human, and more than human, assets, capacities, and products and the institutionalized organization of the human economic sub-system.

Much work in critical green political economy has rightly focused on excessive consumption and consumerism in the minority/over-developed world. This work has revealed how the lifestyles, aspirations for and views of the 'good life' and associated economic structures of globalized capitalism, which largely serves the interests of the minority world (and the economic elite), have systematically locked the world into an ecocidal trajectory. This critical work on consumption and consumerism shows how, beyond a threshold, the 'iron cage of consumerism' (Jackson, 2013) within a growth oriented economy creates dangerous ecological risks, increases inequalities, status competition, ontological insecurity and anxiety. Consumerism can corrode solidarity and community and can, by orientating people inwards and to themselves (notwithstanding the very social character of consumerism), reduce people from being *citizens* to individualized and privatized *consumers* (Lynch and Kalaitzake, 2018). In short, consumerism as a permanent (as opposed to a transient) activity and goal, is unsustainable, unfair and undesirable. Just as the imperative of endless and infinite growth can lead to 'uneconomic growth' – that is, cause more economic negatives than positives, and imperil long-term economic development – so consumerism (a key engine of modern growth) can pass a point where it reduces rather than adds to human wellbeing and flourishing.

Some of the green political economy research in this area demonstrates, for example, the multiple co-benefits of strategies to socialize (and decommodify) consumption, and separate ownership of goods and services from their use and enjoyment (*e.g.* Barry, 2012). Other research stresses the need to recompose and reconstitute consumption in the minority world – such as Ian Gough's argument for strategies and policies to recompose consumption (based on distinguishing needs from luxuries) and focused on attaining ecological sustainability and social equity (Gough, 2017). While such critical work on consumption and consumerism is important and needed, my aim in this article is to focus on how green political economy should analyse, think about and reconfigure the organization of production and human collective labour as part of any *just* transition from 'actually existing unsustainability.'

Democratizing work

"The production of too many useful things produces too large a useless population."
Marx (1959: 51)

In mainstream policy and academic discourse on the transition from our current unsustainable and ecocidal economic system, production figures largely in terms of finding technological solutions to 'decouple' increasing production from energy, pollution and resource use. That is, to find technological innovations to decouple endless economic growth (and consumerism) – as a permanent target of the human economic sub-system – from the non-growing, regenerative larger ecological and biophysical system of which that human economy is a part. That is to say, the focus has been 'green business as usual'. I have elsewhere argued that this 'techno-optimistic' strategy is highly unrealistic (indeed, some of the thinking and policy proposals in this space can fairly be described as mythical) and therefore dangerous (Barry, 2016). But such discourse is also profoundly depolitical and depoliticizing (if not outright anti-political) – and thus its appeal to vested interests and those supportive of the political economy *status quo*, as well as to those who have lost hope or faith in political and democratic

"The lifestyles, aspirations for and views of the 'good life' and associated economic structures of globalized capitalism have systematically locked the world into an ecocidal trajectory."

solutions to our ecological, resource and energy dilemmas.

But such techno-optimist, magical ways of thinking about the human economic sub-system do not exhaust how we should approach the analysis of the sphere of production and the organization of human work. To begin with, for reasons that will become clearer below, it is important to maintain a distinction between *employment* and *work*. I view employment as a sub-set of human productive labour or work, a key characteristic of which is that it is remunerated (*i.e.* it is a form of wage labour). This common distinction between employment and work tracks another important distinction for green political economy: that between 'formal', money-based and measured economic activities (as captured, most importantly, by GDP), and what are variously termed practices, activities, relationships and exchanges within the 'core,' 'convivial,' 'care' and 'reproductive' human economy (*e.g.* Illich, 1973; Escobar, 1995; Coote, 2010).

I wish to make the argument that from a green (and republican) political economy perspective on a just transition away from an ecocidal growth economy, there are both ecological–sustainability and social–ethical reasons for, and advantages of, democratizing work *qua* formally paid employment. We can begin by asking: how can we say a truly democratic society exists when the vast experience of the overwhelming number of its citizens is 'wage slavery' in formal, undemocratically organized employment? Consistent with long-standing green political arguments for greater democratization of economic and political life (including decentralization), the green republican asks 'why should democracy end at the factory/office/classroom door?' Here, green republicanism can be seen to echo older socialist and Marxist critiques of the exploitation of labour under industrial capitalism, and how some of these critiques in turn echo recognisably *republican* political concerns against domination and the constraining of human freedom. This is noted, for example, by Quentin Skinner, who remarks (Skinner, in Marshall [2013]):

> I am very struck by the extent to which Marx deploys, in his own way, a neo-Roman political vocabulary. He talks about wage slaves, and he talks about the dictatorship of the proletariat. He insists that, if you are free only to sell your labour, then you are not free at all. He stigmatises capitalism as a form of servitude. These are all recognizably neo-Roman moral commitments.

Removing the compulsion to enter into employment (something contemporary greens have promoted, for example via such policies as a universal basic income or services), and democratizing employment via worker self-government, would not only help realize republican goals of freedom as non-domination. Democratizing employment could also enable the realization of internal goods of human collective labour, especially in a post-growth context. But one of the obstacles intellectually, and especially in policy terms, standing in the way of reconfiguring employment along more democratic lines (and one that is functionally useful both for the growth-obsessed political economy of capitalism, and for the despotic, non-democratic organization of employment) is a profoundly narrow and negative view of work.

"There are both ecological, sustainability and social, ethical reasons for, and advantages of, democratizing work qua formally paid employment."

The shadow of 'Adam's Curse': The ideology of work as disutility

"To Adam he said, 'Because you listened to your wife and ate fruit from the tree about which I commanded you, "You must not eat from it," cursed is the ground because of you; through painful toil you will eat food from it all the days of your life.'"
Genesis, 3:17

Pain for women in childbirth and 'painful toil' for men are the Christian God's gendered punishments for humanity for daring to eat of the tree of knowledge. And this negative view of work still holds in both 'common-sense' and intellectual discussions of work. Since modernity the latter discussions have been dominated

by political economy/economics and its view of work as 'disutility' – something essentially negative, for which one requires an *external* reward in the form of wages. While defenders of capitalism saw work as 'necessary pain' for gain and/or salvation, even progressives and revolutionaries formed their utopian political alternatives to industrial capitalism in terms of minimizing human labour through machinery and technology and presented non-work as central to the 'good life'. Thus Marxists and other anti-capitalist political ideologies echoed ancient Greek ideas of freedom as essentially 'freedom from work'. The Greeks, like the Hebrews, regarded work as a curse – one of the Greek words for 'work' being πόνος (*ponos*), which could also mean 'sorrow' or 'hardship'. Manual labour was for slaves and women in the domestic sphere. Free men did not work; their status as free citizens was directly proportional to their freedom from work, allowing them the resources and time to pursue 'higher' goals of warfare, philosophy, poetry, large-scale business, architecture or sculpture.

Fast forwarding to the late 19th century, we find Marx's son-in-law Paul Lafargue writing in praise of idleness and leisure, and making the argument that it was capitalism that was preventing humanity from being liberated *from* work. Interested in profits and exploiting workers, the capitalist system means that, "The blind, perverse and murderous passion for work transforms the liberating machine into an instrument for the enslavement of free men. Its productiveness impoverishes them" (Lafargue, 1907: 30). It was not the truth, but *machines*, that would set humanity free... from work. This point prefigures later green (and global southern/decolonial) arguments for 'useful unemployment' (Illich, 1978) and a rejection of Eurocentric and capitalist ideas of productive labour and how 'the economy' and 'economics' could or should be conceptualized (Barry, 2012).

In this way, both defenders of capitalism, notably classical and later neoclassical economics, and critics of capitalism, agree (in some measure) on this essentially negative view of human (manual) labour. This leads to the narrowly *instrumental* view of work, especially work *qua* employment, found in neoclassical economics. The very language mainstream economics uses to describe employment and wages is revealing: wages 'compensate' for the painful 'disutility' of labour. To compensate someone is to recognize a loss of something valuable that needs to be replaced with something else – 'free time' for 'wages'. Against this view, one of the main green republican reasons for democratizing employment is that this would allow the realization of some of the *internal* goods of human labour, such as autonomy, authenticity, creativity, cooperation and self-realization (Barry, 2012; 2016). Yet all of these are summarily discounted in most mainstream political economic models and thinking with its 'compensating wage' model of work. Hence, there is a pressing need to challenge neoclassical/orthodox views of employment as 'disutility' – that is, primarily only engaged in to secure wages.

To do this we need fundamentally to challenge the claim dominant in both neoclassical economics and 'common-sense' thinking, that work is something that is intrinsically something bad, negative or a disutility. What are the origins of this claim/assumption (or more correctly 'axiom' in orthodox economics – a value judgement 'smuggled in' and presented as a 'fact' [Barry, 2018])? Apart from ancient Greek and Christian views remarked on above, a main source are classical political economists such as Adam Smith, who defined work as "toil and trouble" (Smith, 1976: 47), or early utilitarian philosophers such as Jeremy Bentham who noted that, "Insofar as labour is taken in its proper sense, love of labour is a contradiction in terms" (Bentham, 1983: 104). Even a liberal proto-green such as John Stuart Mill opined that, "Work, I imagine, is not a good in itself. There is nothing laudable in work for work's sake" (Mill, 1984: 90). Dutiful Christian political economists to a man, this was the prevalent view of work

"Democratizing employment would allow the realization of some of the internal goods of human labour, such as autonomy, authenticity, creativity, cooperation and self-realization."

(or, more specifically, of manual labour) in modernity (*cf.* Arendt, 1958).

Human labour in short was a 'necessary evil' that simply had to be endured; it was not something that could or should be enjoyed. Hence, the best outcome for an individual was to enjoy the fruits of *someone else's* labour, for *human freedom consisted not in work but in freedom from it (including especially reproductive work).* This was a view enthusiastically promulgated by neoclassical economics, but with a new twist: not only was work disutility, but it should be managed and organized for the purposes of maximizing productivity and profits.

> "Almost every technological innovation under capitalism has increased material output not human freedom."

Conceptualizing work as 'disutility' also forms the basis of another problematic assumption (found in both neoclassical economics and 'commonsense' views of the economy and the sphere of work and production). This is the pervasive view (especially from a 'management' perspective, but also found beyond this) of workers as actual or always potential 'shirkers,' and the justification of the types of intrusive surveillance outlined in the next section. From a republican perspective, concerned as it is with freedom as non-domination, there is something suspicious and paternalistic in viewing work as something only motivated by and organized around external rewards (*i.e.* compensation for which the worker is dependent upon someone else to determine and deliver). Such an instrumental view of work necessarily leads to (as well as being due to) dependency on the will and power of others. And such dependency of course creates the conditions for vulnerability and unfreedom, as discussed below.

If work is conceived of as a disutility (painful, toilsome and so on), then it is rational to think that workers will always seek to avoid it – it is, in other words, a short step from Marx's 'wage slaves' to 'work-shy idlers'. This in turn produces a need to put in place employment-based processes to monitor, discipline and limit such 'shirking'. That is, productivity requires the non- and anti-democratic structuring of employment. The structuring of production involves power differentials, unequal bargaining positions, property rights, ownership and control, as well as the management systems of governance that structure and organize conditions and internal processes of employment. Wage slavery, discipline and intrusive monitoring are the preconditions for the 'productive unfreedom' under capitalism, with the threat of 'work shy idlers' being simply a micro version of the structural imperative for capitalism to minimize employment costs at a macro scale. How else can we explain that almost every technological innovation under capitalism has led to less people working more and not more people working less? Or that these innovations have increased material output not human freedom?

Wage-slavery and productive unfreedom: Growth through discipline

> "The slave is sold once and for all; the proletarian must sell himself daily and hourly. The individual slave, property of one master, is assured an existence, however miserable it may be, because of the master's interest. The individual proletarian, property as it were of the entire bourgeois class which buys his labour only when someone has need of it, has no secure existence."
> Engels (1925: 9)

Non- or anti-democratic forms of management and governance, such as we find in most, if not all, forms of modern employment are, from a green and republican point of view, forms of domination and alienation – 'despotic experiences of non-autonomy' on a daily and mass basis. We can dismiss as fiction the suggestion of neoclassical economists that workers *voluntarily* submit themselves to such forms of 'despotic power' because workers can 'choose' whether to work or not (with unemployment consequently being viewed as 'voluntary leisure').

As illustrations of this 'despotic power' in the sphere of employment and production, let us consider some recent examples

from the US (a pioneer of innovations in production, including the control of workers, which other countries tend to follow). Amazon prohibits employees from exchanging casual remarks while on duty, calling this 'time theft'. Apple inspects the personal belongings of its retail workers, some of whom lose up to half an hour of unpaid time every day as they wait in line to be searched. Tyson prevents its poultry workers from using the bathroom. Some have been forced to urinate on themselves while their supervisors mock them.

> About half of US employees have been subject to suspicionless drug screening by their employers. Millions are pressured by their employers to support particular political causes or candidates. Soon employers will be empowered to withhold contraception coverage from their employees' health insurance. They already have the right to penalize workers for failure to exercise and diet, by charging them higher health insurance premiums.

While one cannot say this assertion (Anderson, 2017) is true of every workplace, the point is that these 'private governments' control individuals *qua* employees, often (especially amongst non-unionized workforces) without any or much inclusion of the voice of workers, countervailing power by workers, or transparency and accountability in managerial decision-making. The scope of unelected, arbitrary power and authority that bosses have over workers, and thus the real and present danger of causing multiple and complex forms of on-going and sustained harms, is such that the organization of employment should be of pressing concern for green republicans.

Of interest here from a green republican political economy point of view is that the main justification used for maintaining (and extending) workplace dictatorships and denying democracy in the workplace is efficiency, labour productivity and maximizing production. In a word, maximizing output growth while minimizing inputs. Introducing democracy and worker voice into the workplace could lower productivity and reduce economic growth. But what if such a linear and instrumental focus on enhancing productivity and orthodox efficiency were less dominant? Indeed, what if such as focus was seen as both ecologically irrational and socially deficient?

For straightforwardly ecological reasons around 'limits to growth' we could envisage a green republican policy preference for this. Relaxing or abandoning altogether the demands of productivity, efficiency and growth at the micro level of the firm would, *ceteris paribus*, contribute to the 'in built redundancy' or 'head room' (a key characteristic of any resilient system) at a macro-economic level required to ensure the human economy stays within the sustainability parameters of planetary boundaries. That is, introducing non-productivity goals and associated practices (such as those related to the realization of some of the internal goods of collective human labour) within the productive sphere would contribute directly to a transition to a more resilient and sustainable macro-economy. To the oft asked question as to whether the transition to a green, less unsustainable economy and society requires more or less democracy, at least in this instance we have an unambiguous answer: *more democracy and the progressive democratization of the productive sphere would directly create a less unsustainable economy.* More democracy, less unsustainability – in essence: more freedom for less stuff, and thus the unshackling of production (and technology) from the goals of efficiency, labour productivity, output maximization and the ideology and imperative of economic growth. And whither capitalism? If Marx was in awe of, as well as in thrall to, the productive power slumbering in the lap of social labour under capitalism, it seems clear that the liberation of social labour from growth and productivity (*etc.*) is also a liberation from capitalism, since capitalism is inextricably bound up with the pursuit of endless growth and capital accumulation above all else.

"More democracy and the progressive democratization of the productive sphere would directly create a less unsustainable economy."

From employment to work

"Having real control of our work and time not only means improving the quality of work, it also means expanding the proportion of our lives when we do not have to do paid work at all."
New Economics Foundation (2016: 36)

A strong case can be made that a post-productivist, post-growth political economy is also a 'post-employment' (whether market or state-based) one, and one in which unpaid, non-remunerated forms of work increases, even as formally paid employment is progressively democratized. Alongside the long-standing green economic proposal for a universal basic income, the reduction of the working week is another policy which restructures the economy to enable it to become both more ecologically sustainable and meet non- or more-than-economic human ends. As the New Economics Foundation (2010: 2) puts it:

> A "normal" working week of 21 hours could help to address a range of urgent, interlinked problems: overwork, unemployment, over-consumption, high carbon emissions, low well-being, entrenched inequalities, and the lack of time to live sustainably, to care for each other, and simply to enjoy life.

A shorter working week could help break the habit of 'living to work', working to earn and earning to consume; help distribute paid work more evenly across the population, reducing ill-being associated with unemployment, long working hours and too little control over time; enable paid and unpaid work to be distributed more equally between women and men. It would enable what the New Economics Foundation terms the 'core economy' to flourish by making more and better use of uncommodified human resources in defining and meeting individual and shared needs outside the market economy and the state welfare systems.

The 'core economy' is the non-commodified set of assets, resources and relationships that sustain human life, the 'common good' of human sociality; it is related to what others have called the 'life world' or the 'social economy', and also to the (problematic) notion of 'social capital'. These assets, resources and relationships do not have a market price, are produced for free (but not without human labour/work), and do not make profits or aim to fulfil bureaucratic objectives of the state. Its most important component is time, hence the positive impacts that restructuring the existing money economy via a basic income or reducing the formal working week would have on allowing more time for the core economy to grow, deepen and develop. So, while the formal, capitalist/money economy (which includes the state sector) would be governed by a 'post-growth' imperative macro-economically (even while allowing distributed growth between micro-economic sectors – *i.e.* differentiated as opposed to undifferentiated growth), a post-growth (and post- or low-carbon) sustainable economy (now expanded to include the core economy and to include work as well as employment) does allow and indeed call for expansion and growth of the core economy. And while a much more complicated story, the basic idea here is that beyond the social and ecological limits of the *quantitative* economy lies the limitless *qualitative* economy; beyond economic growth lies human social development.

"Beyond the social and ecological limits of the *quantitative* economy lies the limitless *qualitative* economy."

Conclusion

"If ye love wealth better than liberty, the tranquillity of servitude better than the animating contest of freedom, go home from us in peace. We ask not your counsels or arms. Crouch down and lick the hands which feed you. May your chains set lightly upon you, and may posterity forget that ye were our countrymen."
Adams (1906)

We have more than enough evidence that orthodox economic growth beyond a threshold undermines human well-being, is corrosive of community cohesion and social solidarity, and is destructive of the more than human world. For this reason we need to remember that while the end or limiting of economic growth is a major

problem for capitalism, this does not automatically translate into this being a problem for individuals or communities. But only if we adopt the invitation of a green republican political economy perspective, and begin, politically and creatively, to imagine 'economic policy' beyond 'economics'; an 'economy' beyond 'the market'; and 'work' beyond 'employment'.

A green republican political economy needs to challenge the ideology of growth within a consumer capitalist economic system, including proposing to move beyond carbon and indeed beyond the 'employment society'. In order to create a sustainable economy which can enable the flourishing of both human beings and of the more than human world, this political economy seeks to replace the 'live to work, work to earn, earn to consume' treadmill of contemporary productivism and consumerism. Key to this creation of a democratic society and economy, is to envisage political economies that no longer view orthodox, undifferentiated growth as the measure of human progress, or as a permanent feature of the human economic sub-system.

The conceptualization of productive work/employment as a 'disutility', and workers as 'skivers', serves this core state/social imperative of economic growth (Barry, 2018). The productivity imperative within non-democratic workplaces results in both an ecologically unsustainable economy at the macro level, and illiberty-producing and unfreedom-reinforcing practices at the micro level. This paper has thus suggested that a new 'macro-economics of sustainability' (Nadal, 2011; Jackson, 2017) also requires what might be termed a 'micro-economics of democratization'. As Ivan Illich noted, "Wherever the shadow of economic growth touches us, we are left useless unless employed on a job or engaged in consumption" (Illich, 1978: 10). It is time to step out of the shadows. ■

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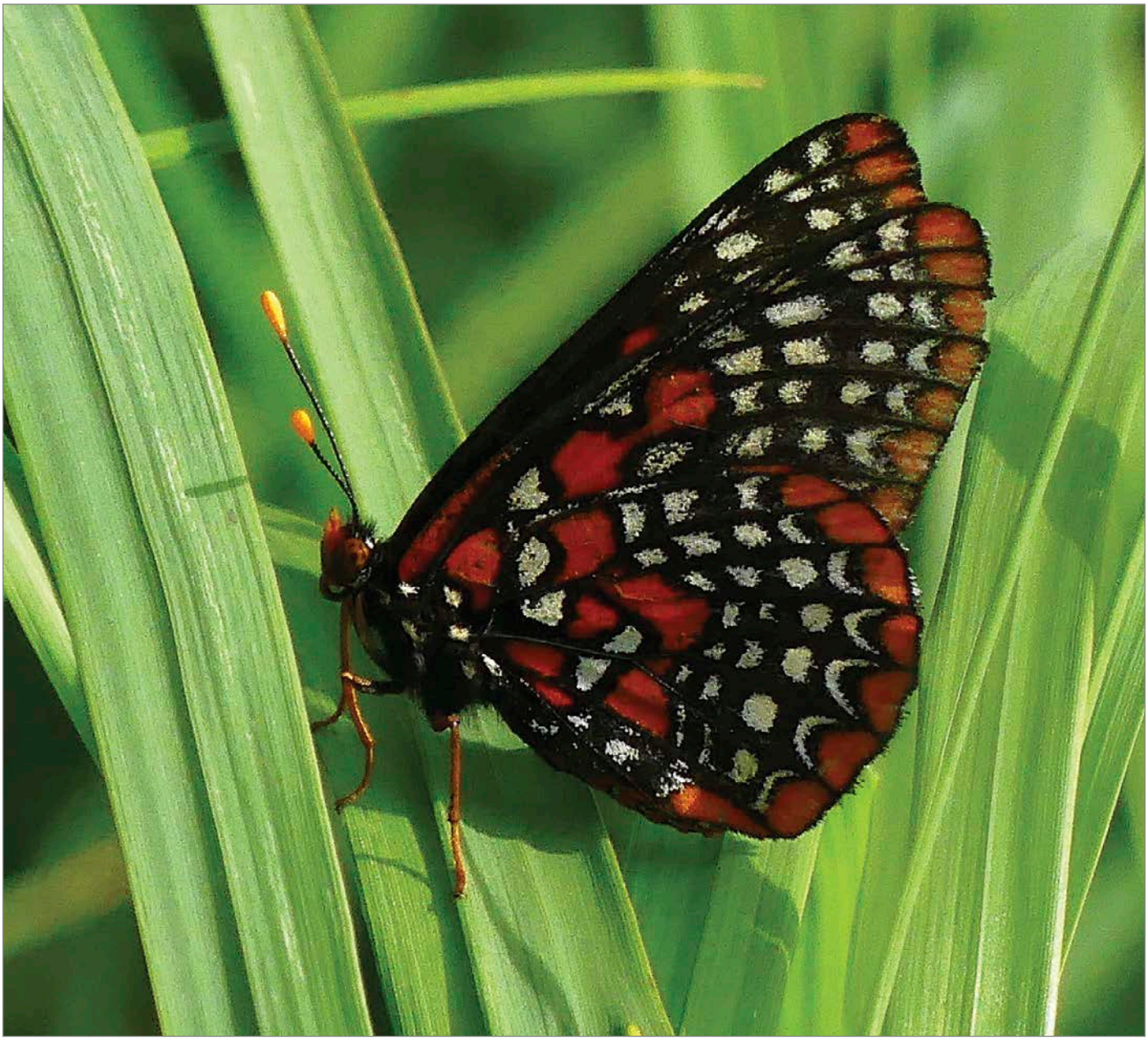

Last Word

"When the crises of capitalism deepen, the task will be to ensure that such destabilized conditions are used to advance progressive humanitarian and ecological ends, rather than exploited to further entrench the austerity politics of neoliberalism."

Samuel Alexander (p20)

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