revolutionary reflections | 'Green Capitalism': a critical review of the literature

Today, hundreds of thousands of young people around the world have been taking part in climate strikes, demanding action on climate change.

As climate change takes hold, questions of how we should understand the role of capitalism in causing it – and whether capitalism has the capacity to resolve it – become ever more urgent. ***Stephen Graham*** *dissects the discourses of sustainability, Green capitalism and the Green economy.*

Introduction

The severity of our environmental predicament comes more clearly into view with each passing news cycle. Only 12 years remain to act if we are to keep the global average temperature rise below 1.5C as required – yet global action on climate change consistently falls far short of what is needed. The ecological rifts opening up are legion.

Despite the severity of the danger to our ecological and social systems, mainstream political elites have shown themselves completely unwilling or unable to take transformative action. But as sea levels, average temperatures, and the frequency of extreme weather events have risen, so too have levels of public anxiety, anger and resistance. People want to know what it is that is pushing us towards the edge of the abyss. And more and more, people are establishing links between capitalist production and environmental destruction. What is less understood, however, is the way that capital has sought to appropriate the green agenda.

The idea that capitalism can be 'greened' is an attractive one for those who seek to maintain capitalist social relations in the midst of an ecological crisis of capitalism's making. Therefore, efforts oriented towards sustainable transition can only advance by engaging in a thoroughgoing critique of this increasingly prominent concept.

This discussion of green capitalism is divided into three parts. Part I considers the notion of 'green' capitalism and examines the contradictions that led to its emergence; it also critiques some of the core theses of Ecological Modernization Theory (EMT) – the body of thought that underpins capitalist green growth narratives.

Part II explores the relationship between capitalism and fossil fuel energy. Discussion focuses on the particular advantages that 'energy dense' fossil fuels afford capitalist production, and examines some of the major barriers that impede the transition to a future based on renewable energy sources.

Part III examines debates between advocates of 'green Keynesian' approaches and supporters of de-growth. It concludes with a discussion of political strategy and environmentally sustainable transition at a time of acute ecological crisis.

A note on 'capitalism'

As Marx explained in the opening of *Capital*, vol. 1, the capitalist mode of production is one in which wealth appears as an 'immense accumulation of commodities'. Commodities are

riven by the core contradiction between their use-value and exchange value.[1] This contradiction is central to understanding what I consider the inherent ecological destructiveness of capitalist production, and key to the potential development of more sustainable alternatives.[2] Money plays a key role in mediating profit-oriented, market-mediated processes of accumulation, and competition drives the dynamic of accumulation.[3] Private property is a crucial factor: the means of production in capitalist social formations are privately owned and controlled, and they are set in motion by the labouring activity of workers who do not own the means of production but who derive income by selling their labour power to capitalist firms.[4]

Following Wright, I understand capitalist social formations to be constituted by both capitalist and non-capitalist elements which, to differing degrees in different contexts, combine and interpenetrate in complex ways.[5] Returning explicitly to ecological concerns, I acknowledge that different capitalist accumulation regimes have different environmental impacts.[6] In certain respects, therefore, referring to capitalism 'as such' might appear too 'abstract' to be useful.[7] However, by analysing 'capitalism in general', we root our discussion of Green Capitalism within the *inner logic of capitalist production*, with its 'incessant drive for economic expansion for the sake of class-based profits and accumulation' – a process in which '[n]ature and human labor are exploited to the fullest'.[8]

These forces are at play regardless of the *type* of capitalist social formation under consideration (whether it purports to be 'green' or otherwise). While such an entry point might be limited in terms of comparative evaluations of the ecological impacts of different capital accumulation regimes, it enables us to consider the potential merits of moving *beyond* capitalist forms of production altogether.

A note on growth

Economic growth is typically considered in mainstream political discourse in terms of Gross Domestic Product (GDP). Reducing growth to this metric, however, is problematic.[9]

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[1] Karl Marx, *Capital: A Critique of Political Economy,* vol. 1 (London: Penguin, 1976); Ngai-Ling Sum, Bob Jessop, *Towards a Cultural Political Economy: Putting Culture in its Place in Political Economy* (Cheltenham: Edward Elgar Publishing, 2013), p. 237.
[2] John Bellamy Foster, Brett Clark, Richard York, 'Capitalism and the curse of energy efficiency', *Monthly Review*, 62:6 (2010); Paul Burkett, *Marx and Nature: A Red and Green Perspective* (Chicago: Haymarket, 2014).
[3] Sum and Jessop, *Towards a Cultural Political Economy*; Bob Jessop, 'Revisiting the regulation approach: critical reflections on the contradictions, dilemmas, fixes and crisis dynamics of growth regimes', *Capital & Class*, 37:1 (2013), 7.
[4] Erik Olin Wright, *Envisioning Real Utopias* (London: Verso, 2010), p. 34.
[5] Wright, *Envisioning,* pp. 34-5; capitalistic features play the dominant role: Bob Jessop, 'The crisis of the national spatio-temporal fix and the tendential ecological dominance of globalizing capitalism', *International Journal of Urban and Regional Research* 24:2 (2000), 323–60.
[6] For example, I consider neoliberalism to constitute a particularly aggressive and ecologically-destructive form of capitalism, see: Naomi Klein, *This Changes Everything: Capitalism vs the Climate* (London: Penguin, 2014).
[7] Max Koch, *Capitalism and Climate Change: Theoretical Discussion, Historical Development and Policy Responses* (Houndmills and New York: Palgrave Macmillan, 2012), p. 37.
[8] John Bellamy Foster, Brett Clark, Richard York, 'Ecology: the moment of truth – an introduction', *Monthly Review*, 60:3 (2008).
[9] Gareth Dale, 'The growth paradigm: a critique', *International Socialist Journal*, 134 (2012); James Meadway, 'Degrowth and the roots of neoclassical economics', in: Gareth Dale, Manu V. Mathai, Jose

GDP as a measure of economic activity focuses on flows to the exclusion of assets.[10] It fails to incorporate welfare losses due to unequal distribution of income; illegal transactions; and 'non-market services' such as domestic labour and voluntary work.[11] GDP treats the sale of natural resources as income but does not subtract for resource depletion or depreciation; neither does this metric account for 'externalities' such as environmental degradation or noise pollution (it does, however, account for market-mediated solutions to such problems).[12] Another prominent critique of GDP relates to its inability to account for societal well-being (the so-called Easterlin Paradox).[13]

Despite these inadequacies (or perhaps because of them), economic growth constitutes a key policy objective for capitalist nation states worldwide. This dominance, suggests Dale, rests on the ubiquity of the modern 'growth paradigm' – the proposition that economic growth is '*good*, *imperative*, essentially *limitless*, and the *principal remedy* for a litany of social problems'. The notion of growth, Dale suggests, performs a vital ideological function – ranking alongside nationalism as a means to present 'particular interests as the general interest, and of incorporating the producing classes within the capitalist hegemonic project'.[14]

According to Harvey, long-term growth is a necessary feature of capitalism. He notes that:

> …a zero-growth capitalist economy is a logical and exclusionary contradiction. It simply cannot exist. This is why zero-growth defines a condition of crisis for capital. If prolonged, zero growth of the sort that prevailed in much of the world in the 1930s spells the death knell of capitalism.[15]

While some seek to understand the ecologically destructive tendencies of capitalism in terms of an incessant drive for economic *growth*, others consider the issue instead in terms of capital *accumulation* (of which growth can be understood as a reconfiguration or fetishized reflection). In capitalist social formations, such accumulation is sought not only by individual capitalists; it constitutes an absolute necessity for the system at large.[16]

Puppim De Olivera (eds.), *Green Growth: Ideology, Political Economy and the Alternatives* (London: Zed Books, 2016); Joseph E. Stiglitz, Amartya Sen., Jean-Paul Fitoussi, *Report by the Commission on the measurement of economic performance and social progress* (Paris, 2009). Bonneuil and Fressoz, drawing on Mitchell, suggest that the 'abandoning of the gold standard in the 1930s… and the invention of GDP for national accounting completed the dematerialization of economic thinking, so that the economy could now be conceived as growing indefinitely without coming up against physical limits': Christophe Bonneuil, Jean-Baptiste Fressoz, *The Shock of the Anthropocene: The Earth, History and Us*, trans. David Fernbach (London: Verso, 2017), p. 161; Timothy Mitchell, *Carbon Democracy: Political Power in the Age of Oil* (London: Verso, 2011).

[10] Dale, 'Growth paradigm'.

[11] Tim Jackson, *Prosperity without Growth: Economics for a Finite Planet* (London: Earthscan 2009), pp. 179-89.

[12] Dale, 'Growth paradigm'.

[13] Giorgos Kallis, 'Socialism without growth', *Capitalism Nature Socialism* (2017), 1-18; Joan Martínez-Alier, 'Environmental justice and economic degrowth: an alliance between two movements', *Capitalism Nature Socialism* 23 (2012), 62; Richard Wilkinson, Kate Pickett, *The Spirit Level: Why Equality is Better for Everyone* (London: Penguin, 2010).

[14] Dale, 'Growth paradigm'.

[15] David Harvey, *Seventeen Contradictions and the End of Capitalism* (London: Profile Books, 2014), p. 232.

[16] Ståle Holgersen, Rikard Warlenius, 'Destroy what destroys the planet: Steering creative destruction in the dual crisis', *Capital & Class*, 40:3 (2016), 518; Marx, *Capital*, vol. 1.

Such a focus on accumulation has given rise to debates on the environmentalist left between those calling for 'de-growth',[17] and eco-Marxist thinkers demanding instead an emphasis on 'de-accumulation'.[18] Some 'de-accumulationists' have gone so far as to argue that growth could be 'greened' in a post-capitalist society 'if the institutions and dynamics that drive capitalist accumulation were abolished and full democracy was established'.[19] We will return to this important issue below.

Regardless of whether one focuses on growth or accumulation, the historic relationship between capitalist social formations, economic growth, and increasing levels of material/energy throughput is clearly problematic in terms of ecological sustainability. It is this contradiction that the concept of 'green capitalism' seeks to address.

Part I

1.1. 'Green growth' and the rise of the 'green' economy

The interrelated notions of 'green growth' and 'green economy' together constitute the foundation on which an already large and ever-growing body of ecological thinking is based. To help us consider the prominence of 'green' growth/economy discourses today – as well as the basis of some of the most common arguments against them – I will briefly outline the concept's historical emergence.

'Sustainable Development'

The roots of the 'green' growth/economy concept can be traced back to the 'sustainable development' agenda, the origins of which are in turn located in the economic dislocation and rising levels of ecological consciousness of the 1970s. This decade saw not only the crisis of Fordism and the first and second oil shocks, but also the development of an increased awareness of the environmental limits to capitalist accumulation in advanced capitalist countries. [20]

The notion of sustainable development was popularized – particularly in policy circles – by the publication of the Brundtland Commission's 'path breaking' report on global environment and development in 1987. This report opened the way for the significant involvement of non-governmental organisations (NGOs) in environment and development issues.[21] Its

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[17] Giacomo D'Alisa, Federico Demaria, Giorgos Kallis (eds.), *Degrowth: A Vocabulary for a New Era* (Oxford: Routledge, 2015); Kallis, 'Socialism without growth'; Serge Latouche, *Farewell to Growth* (Cambridge: Polity, 2009).

[18] John Bellamy Foster, 'Capitalism and Degrowth: an impossibility theorem', *Monthly Review*, 62:8 (2011), 26-33.

[19] Leandro Vergara-Camus, 'Capitalism, democracy, and the degrowth horizon', *Capitalism Nature Socialism* (2017).

[20] Bob Jessop, 'Nicos Poulantzas on political economy, political ecology, and democratic socialism', Journal of Political Ecology, 24 (2017), 186-99. Indeed, this decade saw the rise of the Catton and Dunlap's 'New Ecological Paradigm' in environmental sociology, the publication of the influential *Limits to Growth* report by the Club of Rome (1972), the launch of the United Nations' 'Stockholm Declaration on the Environment' (1972), the introduction by the Organisation for Economic Co-operation and Development (OECD) of the 'polluter pays principle' (1972), and the publication of the Ecologist's *A Blueprint for Survival* (1972).

[21] Michael Redclift, 'Sustainable development (1987–2005): an oxymoron comes of age', *Sustainable Development*, 13:4 (2005), 212–27.

publication can be considered a key moment in the general shift that occurred in the 1980s from an approach based on social movement politics towards 'non-conflictual', market-based approaches more concerned with environmental taxes and pollution trading.[22]

The Brundtland report prepared the ground for the first Earth Summit in Rio de Janeiro in 1992.[23] This summit would prove significant for cementing the discourse of sustainable development, with its focus on resource management, and reconciling environmental problems with economic development (for more on ecological modernization, see section 1.2, below).[24]

From 'sustainable development' to 'green growth/economy'

Although rarely heard prior to 2008, the term 'green growth' has since moved into the mainstream of international policy discourse.[25]

Like 'sustainable development' before it, the concept of 'green' growth/economy is sufficiently slippery that there exists no commonly agreed definition. The World Bank considers 'inclusive green growth' (rather vaguely) as 'economic growth that is environmentally sustainable';[26] for the United Nations Environment Programme (UNEP), a green economy is one that 'results in improved human wellbeing and social equity, while significantly reducing environmental risks and ecological scarcities'.[27] Also like its predecessor, the 'green growth/economy' concept is driven by the 'increasing urgent necessity to deal with environmental scarcity and degradation which is seen to threaten economic growth and development'.[28]

Whether the discourse of 'green' growth/economy constitutes a continuation of sustainable development discourse, or whether it is something related but different, remains the subject of debate.[29] For Kenis and Lievens, the green economy 'project' emerged from one particular construal of the 'sustainable development' agenda. This construal emphasises 'the capacity of the market to deliver sustainability, and to reconcile economic, environmental, and social goals'.[30]

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[22] Holgersen, Walrenius, 'Destroy', 514; Max Koch, *Capitalism and Climate Change: Theoretical Discussion, Historical Development and Policy Responses* (Houndmills and New York: Palgrave Macmillan, 2012).

[23] At this summit, all UN members ratified the United Nations Framework Convention on Climate Change (UNFCCC), thereby pledging to reduce greenhouse gas emissions and 'prevent dangerous anthropogenic interference with the climate system' (United Nations, 1992).

[24] Ulrich Brand, 'Green economy – the next oxymoron? No lessons learned from failures of implementing sustainable development', *GAIA,* 21:1 (2012), 28.

[25] Michael Jacobs, 'Green growth: economic theory and political discourse', *Centre for Climate Change Economics and Working Paper,* 108 (October 2012); Thomas Wanner, 'The new "Passive Revolution" of the green economy and growth discourse: maintaining the "sustainable development" of neoliberal capitalism', *New Political Economy*, 20:1 (2015), 21-41.

[26] World Bank, *Inclusive Green Growth: the Pathway to Sustainable Development* (2012), p. 24.

[27] United Nations Environment Programme (UNEP), *Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication* (2011), p. 16.

[28] Wanner, 'The new "Passive Revolution"', p. 26.

[29] Brand, 'Green economy'; Wanner, 'The new "Passive Revolution"'.

[30] Anneleen Kenis, Matthias Lievens, 'Greening the economy or economizing the green project? When environmental concerns are turned into a means to save the market', *Review of Radical Political Economics*, 48:2 (2016), 218.

According to Dale, Mathai and De Olivera, although at first sight this new framework appeared as simply a reprise of the sustainable development paradigm, they suggest it differs from its predecessor in three ways.

Firstly, the various 'green' economy projects assert in stronger terms than sustainable development discourses that environmental sustainability is not only compatible with, *but dependent on*, the market system – hence the centrality of ecological entrepreneurs, banks and corporations in 'green' economic activities. Secondly, green growth strategies reconceptualise nature as a specific type of capital which must be measured, conserved, produced and accumulated. Thirdly, whilst sustainable development discourses tended to foreground social justice issues, green growth projects tend to overlook them.[31]

However one conceives the relationship between 'sustainable development' and 'green' growth/economy, Wanner makes a powerful case for considering the latter as ultimately concerned not with the sustainability of planetary resources, but of neoliberal capitalism.[32]

The (so-called) Global Financial Crisis and the Green New Deal(s)

The very future of neoliberal capitalism was thrown seriously into doubt by the Great Recession of 2008. In the aftermath of this crisis, the concept of 'green growth' – pursued through a variety of 'Green New Deal' strategies – emerged as a potential long-term 'exit strategy' from the 'triple crisis' of finance, energy, and environment.[33]

Indeed, the 'triple crisis' provided international institutions (e.g. World Bank, IMF, the UN) with the opportunity both to 'upgrade their environmental credentials and to point to new fields of economic activity… which could relaunch the global market'.[34] This presented a 'unique moment in history in which major environmental and economic challenges could be tackled simultaneously'.[35] Within months of the official acknowledgement of the global financial crisis, public figures such as former US Vice President Al Gore and then-UN Secretary-General Ban Ki-Moon, worked to convince governments that economic recovery strategies had to be 'green'. In December 2008, Ban Ki-moon, stated that:

> …Together, we face two crises: climate change and the global economy. But these crises present us with a great opportunity—an opportunity to address both challenges simultaneously. Managing the global financial crisis requires massive global stimulus. A big part of that spending should be an investment—an investment in a green future. An investment that fights climate change, creates millions of green jobs and spurs green growth. We need a Green New Deal… [36]

A surge of policy documents soon followed. For example, in 2009, the United Nations Environment Programme (UNEP) released the *Global Green New Deal* report, which set out a mix of policy actions that would 'stimulate economic recovery and at the same time improve

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[31] Gareth Dale, Manu V. Mathai, Jose Puppim De Olivera (eds.), *Green Growth: Ideology, Political Economy and the Alternatives* (London: Zed Books, 2016), pp. 4-5.
[32] Wanner, 'The new "Passive Revolution"'.
[33] Bob Jessop, 'Economic and ecological crises: green new deals and no-growth economies', *Development*, 55:1 (2012), 17-24.
[34] Anneleen Kenis, Matthias Lievens, *The Limits of the Green Economy* (London: Routledge, 2015), p. 4.
[35] Kyla Tienhaara, 'Varieties of green capitalism: economy and environment in the wake of the global financial crisis', *Environmental Politics*, 23:2 (2014), 187.
[36] Ban Ki-Moon, *Opening statement to the High-Level Segment of the UN Climate Change Conference* (11 December 2008).

the sustainability of the world economy'. Specifically, it called on governments to allocate stimulus funding to green sectors, which aimed to promote economic recovery, poverty eradication and carbon reduction.

Soon after came the OECD's *Interim Report of the Green Growth Strategy* (2010), then the European Commission's *Roadmap for Moving to a Low Carbon Economy in 2050* (2011), the World Economic Forum's *More with Less: Scaling Sustainable Consumption and Resource Efficiency* (2012) and the World Bank's *Inclusive Green Growth* report (2012).

Indeed, so influential had the notion of the 'green economy' become that, two decades after the Rio Earth Summit, the Rio +20 conference on Sustainable Development, called *The Future We Want* (2012), was entirely dedicated to this issue. A means by which to incorporate increasingly public ecological concerns into the dominant political-economic paradigm, it continues to form a key plank of mainstream ecological-economic thinking today (see below).

Resistance to the green economy

The 'green' economy's rise to dominance has not gone uncontested, however. Alongside attempts by corporate interests to thwart its development and implementation, there has also been marked resistance from grassroots political organisations, civil society groups and global networks. As Goodman and Saleh note, this was much in evidence at the fringes of the Rio +20 summit when a counter-hegemonic force of environmentalists, socialists, feminists, peasants and indigenous peoples formed an oppositional alliance' at the 'People's Summit' to voice concerns regarding pathways based on green growth. The Rio+20 conference, Goodman and Salleh suggest, highlighted the new political struggle between two clearly delineated global forces which introduced 'a new chapter in the history of class conflict'.[37]

Other notable examples of 'bottom-up' resistance to the development of the neoliberal green economy can be found among initiatives associated with the *Vivir Bien* movement in Latin America, and within alternative agricultural movements such as Harvali project in India, community-supported agriculture schemes in the UK, and the Movimento dos Trabalhadores Sem Terra (Landless Workers Movement, or MST) in Brazil.[38] Trenchant critiques of the concept have also come from de-growth proponents and advocates of eco-Marxism.[39]

It must be noted that, despite the initial fervour that surrounded the green economy following the economic crisis, the green stimulus packages championed in its immediate aftermath failed in any meaningful sense to materialise.

As Tienhaara notes, it was not long before the New Deal symbolism was quietly dropped. Stimulus packages tended to be wound down.[40] As political attention in many countries turned instead to austerity programmes, interest in the GND waned (albeit temporarily – as

[37] James Goodman, Ariel Salleh, 'The "Green Economy": class hegemony and counter-hegemony', *Globalizations*, 10:3 (2013), 412.
[38] Steffen Böhm, Maria Ceci Araujo Misoczky, David Watson, Sanjay Lanka, 'Alternatives to Green Growth? Possibilities and contradictions of self-managed food production', in: Dale *et al., Green Growth.*
[39] Giacomo D'Alisa, Federico Demaria, Giorgos Kallis (eds.), *Degrowth: A Vocabulary for a New Era* (Oxford: Routledge, 2015); John Bellamy Foster, Brett Clark, Richard York, *The Ecological Rift: Capitalism's War on the Earth* (New York: Monthly Review Press, 2010).
[40] Kyla Tienhaara, 'Governing the global green economy', *Global Policy,* 7:4 (2016), 485.

we will discuss below, the concept has risen to prominence once again, particularly in the US.

The notion of green growth, however, has continued to play a key role within mainstream political circles as hegemonic actors have sought to incorporate growing public demands for a response to the ecological crises into their policy repertoire.[41]

If one accepts the criticisms of the concept of green growth, then these examples support the arguments of those who claim that green growth constitutes a 'tranquilising dispositive' – a way to incorporate environmental issues into the mode of production and living in highly selective ways beneficial for capitalist development, yet limited in terms of ecological protection potential.[42]

As we will see below, this is not to reject outright the notion of ecologically sensitive growth. However, the foregoing does raise questions regarding the very possibility of a meaningfully green capitalist regime. To explore this theme further, it is necessary to look more closely at the theoretical foundations of the concept 'green growth'.

1.2. 'Green' growth and Ecological Modernization Theory (EMT)

As Pellow and Brehm suggest, to a lesser, greater – and sometimes total – extent, 'green' growth strategies are based on technological innovation. Through the development of ever more efficient productive technologies, the argument goes, society can become more sustainable while economic expansion continues apace. Indeed, 'strong' interpretations of this view claim that such a transformation is *only possible through such productive innovation.*[43]

Such a view lies at the heart of the Ecological Modernization (EM) thesis, which – alongside political 'modernization', corporate innovation and changes in environmental governance – advocates the adoption of 'cleaner technologies that increase the efficiency with which societies use natural resources'.[44]

Tracing the roots of EMT

Ecological Modernization Theory originated in Europe during the 1980s, and in its initial form can be considered as the 'social scientific elaboration and formalisation of the underlying philosophy concerning environmental change articulated in the Brundtland report'.[45]

EM theorists sought to structurally anchor environmental concerns within the market. To do so, Mol, Spaargaren and Sonnenfeld note that it was necessary to:

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[41] Joel Wainwright, Geoff Mann, *Climate Leviathan: A Political Theory of Our Planetary Future* (London: Verso, 2018); Wanner, 'The new "Passive Revolution"'.
[42] Ulrich Brand, 'Green economy, green capitalism and the imperial mode of living: limits to a prominent strategy, contours of a possible new capitalist formation', *Fudan Journal of the Humanities and Social Sciences* 9:1 (2016), 107–121.
[43] David N. Pellow, Hollie Nyseth Brehm, 'An environmental sociology for the twenty-first century', *Annual Review of Sociology,* 39 (2013), 232.
[44] Thomas K. Rudel, J. Timmons Roberts, JoAnn Carmin, 'Political Economy of the Environment', *Annual Review of Sociology*, 37 (2011), 233.
[45] Arthur P. J. Mol, David A. Sonnenfeld, Gert Spaargaren, (eds.) *The Ecological Modernisation Reader: Environmental Reform in Theory and Practice* (London and New York: Routledge, 2009), p. 6.

> …leave behind prior tendencies within organised environmentalism that favoured vitriolic critiques of capitalism and industrialism and focussed on making a fundamental break with modernity (Mol, Spaargaren and Sonnenfeld, 2010:7).

To bring about environmental reform, they argue that such a:

> …romantic yearning to revert to an agrarian past premised on 'small is beautiful' ideals had to be replaced by a more pragmatic posture that created space for dialogue and negotiation between professionalised environmental movements, expanding and diversifying environmental states, and increasingly engaged private sector actors.

In this process, 'environmental futures', they suggest:

> …were not to be imported 'from the outside', but instead developed progressively from within the existing constellation of modernity in a way that reconstructed and redefined extant institutions so that environmental risks and side effects were addressed in a structural manner. During this process of deliberation, it was inevitable that 'ecology loses its influence' because the incorporation of environmental concerns by mainstream economic actors is possible only when environmental criteria, instruments and concepts are reformulated to mesh with the logics of modern markets. [46]

Huber, a key EM thinker, suggests that confrontation between environmental movements and industry was unavoidable during the 1960s-80s. However, more recently such conflict has become unnecessary as, when it comes to ecological degradation, apparently, 'the elites have got the message'. With the elites on board, Huber suggests that future activity can focus on 'cooperation with research, industries and government in favour of ecological modernization'. The question of putting the environmental question on the political agenda, he suggests, has been fulfilled. Therefore:

> Now the race is about ecological modernization: working out integrated solutions to environmental problems and developing innovative technologies to ensure that ongoing societal modernization will pursue a sustainable path to the future. [47]

EMT in its early form had its roots in Europe, but from the mid-1990s on, by engaging with the work of sociologists such as Giddens, Beck Castells, Urry and others on globalization, EM thinkers such as Maartin Hajer, Arthur Mol, Fred Buttel and Gert Spaargaren have sought to move beyond the 'methodological nationalism' of its original Eurocentric focus. While much work has been done to develop a global broadening of EMT, its theorists have remained committed to 'ecologising' the economy and the pursuit of technological solutions to environmental problems. At its core, EMT remains focussed on 'redirecting and transforming "free market Capitalism" in such a way that it less and less obstructs, and increasingly contributes to, the preservation of society's sustenance base in a fundamental/structural way'.[48]

This viewpoint is strongly opposed by thinkers who consider ecological devastation *inseparable from capitalist production*. Hoffmann, for example, argues that EMT's focus on technological change and market-based ecological modernization – at the expense of any consideration of the systemic drivers of environmental degradation – allows for the evasion

[46] Mol *et al*. (eds.) *Ecological Modernisation*, p. 7.
[47] Joseph Huber, 'Ecological Modernization: Beyond Scarcity', in Mol *et al*. (eds.) *Ecological Modernisation*, p. 54.
[48] Arthur P. J. Mol, Martin Janicke, 'The origins and theoretical foundations of Ecological Modernisation Theory', in: Mol *et al*. (eds.) *Ecological Modernisation,* p. 24.

of 'tough' political questions. After all, he suggests: 'it is much simpler to transform technologies than to change societies and their socio-economic drivers'.[49]

For Foster, Clark and York, nothing short of such fundamental societal transformation will suffice. They argue that EM theorists tend to over-emphasise the technological aspect of future development while claiming that 'the institutions of capitalist modernity can avert a global environmental crisis without a fundamental restructuring of the social order'.[50]

For Foster, such 'post-political', eco-modernist approaches are solely geared to 'prioritizing accumulation over the interests of people and the planet'. What he demands instead is a 'frontal assault on the system of capital accumulation' and the 'reconstitution of society at large on a more egalitarian and sustainable basis'. In Foster's view, efforts to protect the planet require:

> …immediate reversals in the regime of accumulation. This means opposing the logic of capital, whenever and wherever it seeks to promote the 'creative destruction' of the planet. Such a reconstitution of society at large cannot be merely technological, but must transform the human metabolic relation with nature through production, and hence the whole realm of social metabolic reproduction.[51]

It is a sentiment shared by Dale, Mathai and De Olivera. They argue that no amount of 'techno-economic fixes and improvements in the management of markets will enable the path of endless growth to continue'.[52] To believe that ecological destruction can be curbed while pursuing growth-oriented policies – whether supposedly 'green' or otherwise – is, they suggest, 'utopian folly'.[53] Yet this is precisely what the green growth argument proposes. Central to this view is the concept of 'decoupling'.

1.2.1. Decoupling

The notion of 'decoupling' suggests that economic growth can be 'delinked' from environmental degradation, resource over-consumption and pollution.[54]

Decoupling has been promoted by many influential bodies, such as the Organisation for Economic Co-operation and Development (OECD, 2014), the European Union (European Environment Agency, 2017), the Breakthrough Institute (2016) and New Climate Economy (2014).

The economist, UN policy advisor and public intellectual Jeffrey Sachs is a prominent advocate of the decoupling concept. For Sachs, decoupling takes place through various policy instruments, for example 'corrective taxation' and public financial support for sustainable technologies. Such 'progressive' policy choices, he suggests, can make it possible to 'achieve growth within planetary boundaries'. Through the process of decoupling, he suggests that:

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[49] Ulrich Hoffmann, 'Can green growth really work? A reality check that elaborates on the true (socio-) economics of climate change', in: Dale *et al.* (eds.)*, Green Growth*, pp. 22-41.
[50] Foster, Clark, York, *Ecological Rift*, p. 140.
[51] John Bellamy Foster, 'The long ecological revolution', *Monthly Review*, 69:6 (2017).
[52] Dale *et al.* (eds.), *Green Growth*, p. 1.
[53] Dale *et al.* (eds.), *Green Growth,* p. 10.
[54] Wanner, 'The new "Passive Revolution"', 29-30.

> …growth can continue while pressures on key resources (water, air, land, habitat of other species) and pollution are *significantly reduced rather than increased*.[55]

The notion of decoupling is indeed an alluring one for those who wish to engage with the problem of ecological destruction without, as Dale, Mathai and De Olivera put it, 'stray[ing] outside the institutional and normative territory of the current political economic prevalent ideas'.[56] That certain interpretations of the decoupling concept present no fundamental challenges to the pursuit of economic growth so central to the process of capital accumulation undoubtedly accounts for its general appeal.

However, as Hoffmann notes, there are very few examples of where such decoupling has occurred.[57] Drawing on Lacanian psychoanalytic theory, Fletcher and Rammelt describe the very notion as a 'neoliberal fantasy', one that functions to obfuscate the fundamental tensions between profitable activity, poverty alleviation and environmental sustainability.[58]

To examine the relationship between decoupling and the ecological impacts of economic growth, it is necessary to differentiate between *relative* and *absolute* decoupling. While the former describes a decline in resources/economic impact *per unit of economic output over time* (rooted in increasing efficiencies in the production of economic goods), the latter concerns a decline in resource use and environmental impact *in absolute terms* (even with a growing economic output).[59]

Relative decoupling is common in production processes on a *micro scale*. However, it does nothing to address the problem of *overall* resource throughput and its detrimental ecological impacts *at the macro level*. For example, although technological development in "advanced" economies may seemingly lead to efficiencies in production that are environmentally beneficial (as highlighted by the Environmental Kuznets Curve), this fails to account for the way such economies rely on commodities produced in 'less developed' economies in other parts of the world.[60]

The EM theorist Sonnenfeld does acknowledge that 'production is supermaterialising in the South, even if arguably dematerialising in the North'. However, he goes on to suggest that such a global ecological imbalance need not be problematic to the EM view. Indeed, he believes that newly industrialising countries (NICs) have '*the advantage* of being able to use the latest, cleaner technologies from the onset of large-scale, modern manufacturing – 'leap-frogging', *while benefitting from inexpensive raw materials and wages*'.[61]

I have taken this extract from Sonnenfeld as I believe it highlights the neoliberal character of EM theory, and in so doing helps to demonstrate the emptiness of many of its claims regarding environmental and social justice. In it, Sonnenfeld ignores the issue of intellectual property and the fact that the new, efficient infrastructure he calls for in NICs must be *financed* – often on terms set by institutions in the Global North that reinforce global power

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[55] Jeremy Sachs, *The Age of Sustainable Development* (New York: Columbia UP, 2015), p. 217 (emphasis added).
[56] Dale *et al.* (eds.), *Green Growth*, p. 1.
[57] Hoffman, 'Can green growth really work', p. 27.
[58] Robert Fletcher, Crelis Rammelt, 'Decoupling: a key fantasy of the post-2015 sustainable development agenda', *Globalizations*, 14:3, (2015), 450.
[59] Wanner, 'The new "Passive Revolution"', 30.
[60] Dale *et al.* (eds.), *Green Growth*, p. 8.
[61] David A. Sonnenfeld, 'Contradictions of Ecological Modernization: Pulp and paper manufacturing in Couth-East Asia', in: Mol *et al*. (eds.) *Ecological Modernisation Reader*, pp. 386-7 (emphasis added).

dynamics at the expense of 'less developed' nations.[62] And when he suggests that Newly Industrialised Countries (as a homogenous entity, it seems) benefit from 'inexpensive raw materials and wages', he clearly highlights his disregard for environmental regulations and labour protection laws.

Another major problem for EM thinkers on the issue of (relative) decoupling is the Jevons Paradox. This contradiction in capitalist production is named after the nineteenth-century bourgeois economist William Stanley Jevons, who noted that the more efficient and cost-effective coal consumption became, the more *desirable* it became as a fuel source. The result, Jevons argued, was that increased efficiency leads to *increased resource consumption*.[63]

One example of this 'rebound effect' is the case of fuel efficiency in private car use in the European Union in recent decades, where the fuel savings of more fuel-efficient cars were outweighed by an increase in overall vehicle numbers and total mileage travelled. While fuel consumption per privately-owned car decreased by around 15% from 1990-2007, total mileage increased by over 40% – consequently, total fuel consumption rose by over 25%.[64]

According to Malm, the Jevons Paradox constantly negates eco-modernist 'pipe dreams' of achieving improved environmental sustainability though increased efficiencies in resource use. He notes that global accumulation has outweighed any positive effects of efficiency gains, and that capital migration (most notably to China) has reinforced the underlying rise in fossil fuel consumption in global production.[65]

As Foster, Clark and York point out, efforts by capitalists to make production more efficient is nothing new – indeed, efficiencies in material and energy use have always been integral to capitalist development.[66] However, given the central aim of capitalist production, efficiency gains made in the production process are primarily utilised in the service of further capital accumulation. As Hoffmann notes:

> The key dilemma is that efficiency and productivity gains [linked to efficiencies in energy and material resource use] tend to boost economic growth, thus ushering in more physical consumption.[67]

To tackle ecological degradation in a meaningful way, then, *absolute decoupling* is required – and this needs to be 'significant, fast, global and permanent'.[68] Yet according to Kallis, absolute decoupling is unlikely in the long term if growth persists. Although one resource might be substituted by an alternative, this only shifts pressure from one area to another.[69]

In capitalist economies, then, breaking the link between increased efficiencies in production and further ecological destruction associated with an ever-growing material throughout appears problematic.

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[62] Mike Davis, *Planet of Slums* (London: Verso, 2006); Naomi Klein, *The Shock Doctrine* (London: Penguin, 2007).
[63] Foster, Clark, York, *Ecological Rift*, p. 141.
[64] Hoffman, 'Can green growth really work', p. 27.
[65] Andreas Malm, *Fossil Capitalism: The Rise of Steam Power and the Roots of Global Warming* (London: Verso, 2016), p. 354.
[66] Foster, Clark, York, 'Long ecological revolution'.
[67] Hoffman, 'Can green growth really work', p. 32.
[68] Hoffman, 'Can green growth really work', p. 26.
[69] Giorgos Kallis, 'Socialism without growth', *Capitalism Nature Socialism*, (2017) 1-18.

Here, however, we here run up against the limits of the concept of green growth as so far conceived. To move forward, we must more fully consider the relationship between economic growth and ecologically sensitive societal transformation. This will entail 1) a closer examination of the category of growth; and 2) a consideration of growth in relation to political strategy at a time of acute ecological crisis. Ongoing debates between supporters of 'green Keynesian' policies and those aligned with the increasingly influential de-growth movement provide a useful entry point for this task. We will return to this issue in Part III. First, however, it is necessary to explore the relationship between capitalist production and fossil fuel energies.

Part II

2.1. Capitalism and fossil fuels

It is now widely accepted that the dangerously high levels of accumulated carbon dioxide in the atmosphere are in large part the historical result of the activities of (certain groups of) humans. It is also commonly accepted that fossil fuel combustion constitutes a key driver of CO_2 emissions.[70]

Fossil fuels have been central to capitalist production for over two centuries.[71] Although capitalist social relations did exist prior to Watt's invention of the double-acting steam engine[72], the development of steam power as the prime mover in capitalist industry enabled the expansion of capitalist social relations on a scale hitherto unimaginable. As Altvater notes:

> Although something like capitalist social forms occasionally could be found in ancient societies (in Latin America and Asia as well as in Europe), they could not grow and flourish without fossil energy… growth was limited, and in fact the average annual growth rate was close to zero before the industrial revolution of late eighteenth century. But in the course of the industrial revolution economic growth rates jumped from 0.2% to more than 2% a year until the end of the twentieth century.[73]

Perhaps the most influential historical narrative regarding the marrying of fossil energy to capitalist production suggests that, through their combination, manufacturers were at last able to transcend the historic limits imposed on production by a lack of available land for growing wood fuel (the 'land constraint').[74]

Wrigley set out to demonstrate the importance of this limitation by converting amounts of coal consumed into the acreage of woodland required to produce an equivalent amount of energy.[75] For example, Wrigley states that in 1750, the coal produced in England would have

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[70] Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2014 Synthesis Report* (2014); Ian Angus, *Facing the Anthropocene: Fossil Capital and the Crisis of the Earth System* (New York: Monthly Review Press, 2016); Malm, *Fossil Capital*.
[71] Elmar Altvater, 'The Social and Natural Environment of Fossil Capitalism', *Socialist Register*, 43 (2007), 37-59; Matthew T. Huber, 'Energizing historical materialism: fossil fuels, space and the capitalist mode of production', *Geoforum*, 40:1 (2008), 105-15; Malm, *Fossil Capital.*
[72] Ellen Meiskins Wood, *The Origin of Capitalism: A Longer View,* 2nd edn. (London: Verso, 2017); Huber, 'Energizing historical materialism'.
[73] Altvater, 'Social and Natural', p. 42.
[74] Edward Anthony Wrigley, *Energy and the English Industrial Revolution* (Cambridge: CUP, 2010).
[75] Wrigley, *Energy;* Malm, *Fossil Capital,* pp. 21-2.

required 4.3m acres of woodland – 13% of national territory; by 1800, this figure had risen to 11.2m acres (35%). By 1850, the amount of woodland required to match energy from coal was 48.1m acres – or 150% of national territory. Considering the geographical confines of the state boundary, the economic limitations imposed by wood-fuelled production are clear. On Wrigley's view, as coal-fired production entailed expanding *down into the earth*, instead of across its surface, its utilization unleashed the power of industrialist capitalist production held in fetters until then.[76]

However, as Huber notes, although forms of energy are central to the ways that people reproduce themselves, it is necessary to steer clear of any kind of 'energetic determinism' that 'divorces historical development from its true social and political basis'. While energy matters, 'it is important to retain a perspective of dialectical complexity that emphasizes the mutually constitutive relations between energy and society'.[77] This consideration will inform the analysis that follows.

The rise of fossil production

Prior to the industrial revolution, around 80-85% of all mechanical energy came from human and animal sources; the rest came from wind and water.[78]

During the 19th century, the shift to fossil fuels displaced human muscles as the core productive force and placed machinofacture centre stage. By freeing workers from certain types of manual labour, fossil fuel-powered machines allowed for an ever more complex division of labour and opened increasing possibilities of ownership of the means of production by an emerging capitalist class over propertyless workers shorn from the means of subsistence.[79] This, Huber suggests:

> …provides the social basis for the development of the productive forces based on capital… The whole notion of workers divorced from the means of production began to make social sense only in the context where the worker is no longer a prime physical force of production.[80]

He adds that:

> …the emergence of large-scale fossilized production hastened the generalization and extension of the wage labor relationship on a scale heretofore unseen.[81]

Malm, too, examines the changes in social relations that fossil fuel-based capitalist production enabled. His analysis of the transition from water to steam power in the British cotton industry from the 1820s onwards is useful for our analysis of the relationship between fossil fuels and capitalist production today.[82] In his study, he challenges the popular

[76] Wrigley, *Energy.*
[77] Huber, 'Energizing historical materialism'.
[78] Carlo Cipolla, *The Economic History of World Population*, 7th edn (New York: Harvester Press, 1978), p. 45.
[79] Huber, 'Energizing historical materialism'; cf. Marx, *Capital*, vol. 1, ch. 27.
[80] Huber, 'Energizing historical materialism', 108-9.
[81] Huber, 'Energizing historical materialism', 110. Fossil fuel-powered machine production allowed more and more commodities to be produced, for which new markets – often in other parts of the world – had to be found (Huber, 'Energizing historical materialism', 111). Increasingly, demand was also driven by requirement of domestic wage workers whose only way to obtain the necessities of life – now that access to means of substance was denied – was through the sale of their labour power and the exchange of wages for these commodities; see: Wood, *Origin of Capitalism.*
[82] Malm, *Fossil Capital.*

view that 1) coal replaced water power as the former was more cost-effective; and 2) that manufacturers seeking to utilise the latter were critically hampered by a shortage of suitable sites.

Malm instead demonstrates how steam power displaced water power *even though water-powered mills were cheaper to run than steam plants, and although plenty of suitable sites for water mills remained*. Contrary to the commonly-held view, he argues that steam power came to dominate in the cotton industry as fossil energy enabled capitalist enterprises to move from often isolated riverside sites – where mill output depended on natural fluctuations in water levels – to the emerging industrial towns where a concentrated oversupply of labour power had settled.[83] Here, capitalist manufacturers could expand production by drawing on reliable reserves of cheap, expendable labour; and no longer at the mercy of seasonal river flows, capitalist production could potentially take place 24 hours a day, seven days a week.

These advantages offered by fossil ('stock') energy over renewable ('flow') sources proved central to the development of early industrial capitalism. They remain no less important to capitalist production today.

This point is emphasised by Altvater, who suggests that, compared to other energy sources, fossil fuels hold so many advantages for capitalist production that they fulfil 'almost perfectly the requirements of the capitalist process of accumulation'.[84] Unimpeded by low windspeeds, unpredictable water levels, or the amount of sunlight available at particular times of day, fossil energy allows surplus value extraction to continue around the clock. As the early cotton capitalists discovered, once production is based on fossil fuels, energy availability need no longer be a primary factor in the location of an enterprise; today, as energy resources (particularly oil and liquid natural gas (LNG)) can easily be transported around the globe, manufacturing can take place wherever labour costs are cheap and environmental regulations lax. By contrast, any dependence on place-bound energy would restrict such freedoms 'as it cannot be assumed that cheap labour and political stability coincide geographically with abundant flows of WWS [wind, water, solar] and low energy prices'.[85]

Another advantage of fossil energies over renewable sources relates to their high Energy Return on Energy Input (EROEI). While it must be noted that not all fossil fuels are equal in this respect – consider the energy required to obtain a barrel of oil from a Saudi field compared to that needed for the same amount from the Canadian tar sands – compared to renewable sources, fossil fuels can be considered a 'thick' energy source. Its entropy is low, its energy concentration very high, and therefore it yields a high energy surplus.[86]

So central have fossil fuels been to capitalist development to date that some deny the very possibility of a non-fossil fuel-based capitalist social formation. Eco-socialist thinker Ian Angus, for example, believes that fossil fuels 'are not an overlay that can be peeled away

[83] This shift had other advantages for capitalist manufacturing, for example, better access to transport links and supplies of raw materials.
[84] Altvater, 'Social and natural', 41.
[85] Rikard Warlenius, 'A renewable Energy Transition: capitalist barriers, socialist entitlements', in: Eskelinen *et al.* (eds.) *Politics of Eco-socialism*, p. 90.
[86] Altvater, 'Social and natural', 39; cf. Vaclav Smil, *Power Density: A Key to Understanding Energy Sources and Uses* (Cambridge: MIT Press, 2015).

from capitalism, leaving the system intact'. Instead, they are 'embedded in every part of the system'.[87] Arguing along similar lines, Altvater suggests that the advantages of fossil energy for the capitalist system make this fuel source 'unique and indispensable'.[88] In contrast to many green growth advocates, he argues that '[t]oday, and possibly for ever, it is impossible to power the machine of capitalist accumulation and growth with 'thin' solar radiation-energy' as this lacks the 'potential of time and space compression, which "thick" fossil energy offers'.[89] Kallis, too, argues against the possibility of a capitalist accumulation regime powered by non-fossil energies. He suggests that if a technology existed that provided abundant, cheap and clean supplies of energy, capitalism would have taken it up by now. The problem, therefore, is more fundamental:

> The coal lobby did not prevent the development of oil, and neither did oil interests block the development of natural gas. If renewable energies could sustain growth, they would have been adopted as quickly as fracking was. My hypothesis is that renewable energies are not adopted because they cannot sustain an economy of the scale and pace of the contemporary global economy.[90]

Such views run counter to the general green capitalist outlook, which (at least ostensibly) considers *renewable, non-fossil* energies as the de-carbonized power source for the ecologically sustainable capitalist production regimes of the future.[91]

To enable us to move on to the next part of the discussion, I will here draw a preliminary conclusion from Part II's findings so far. Fossil fuels have been central to the development of industrial capitalism to date. Compared to energies derived from wind, water and sun, 'thick' fossil fuels offer certain advantages that match almost perfectly the needs of capital accumulation. Primarily, these are: the means to extract surplus value 24 hours a day, seven days a week, regardless of weather fluctuations; the capacity to shift production to wherever labour is cheap and 'flexible'; and the ability to manufacture commodities where environmental protections are weak.[92]

Even with due consideration for these advantages, *in theory* there may be no reason to doubt the *potential* future existence of a capitalist social formation powered entirely by wind-, water- and sun-based energies. In practical terms, however, such an outcome is extremely unlikely. More likely is the continuation for the foreseeable future of dangerously high levels of fossil fuel combustion, despite the well-known ecological consequences of such a course of action. I will now set out a basis for this suggestion.

2.2 Barriers to a renewable energy transition

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[87] Ian Angus, *Facing the Anthropocene: Fossil Capital and the Crisis of the Earth System* (New York: Monthly Review Press, 2016), p. 56.
[88] Altvater, 'Social and natural', 42.
[89] Altvater, 'Socical and natural', 45.
[90] Giorgos Kallis, 'Socialism without growth', *Capitalism Nature Socialism*, (2017), 7.
[91] Sachs, *Age of Sustainable Development*; Arthur P. J. Mol, David A. Sonnenfeld, Gert Spaargaren, (eds.) *The Ecological Modernisation Reader: Environmental Reform in Theory and Practice* (London and New York: Routledge, 2009).
[92] Not only do fossil energies allow production to take place at sites away from 'place-bound' energy sources; thanks to the cheap transport possibilities they afford, commodities produced in such locations can easily be transferred to distant markets. 'Containerisation', for example, has played a key role in global commodity flows in recent decades. This is an example of what Marx described as 'the annihilation of space by time': Karl Marx, *Grundrisse: Foundations of the Critique of Political Economy* (Harmonsdworth: Penguin, 1973), p. 524.

1) *Fossil fuel corporations*

One significant barrier impeding a shift away from fossil energies is the political and economic power of fossil fuel corporations. These businesses rank among the largest in the world.[93] While we must be careful not to *overstate* their influence, it is now well known that these institutions have for decades sought to obfuscate the negative environmental consequences of their operations, and have spent huge sums in efforts to thwart action on climate change.[94]

Given that fossil fuel combustion is a key driver of rising CO_2 emissions, preventing runaway climate change will require that most known fossil energy reserves remain in the ground; exploration for new reserves must also cease. However, as Mahnkopf suggests, 'financial investors who currently spend large sums on finding new reserves are not prepared to be directed away from high-carbon options'.[95]

The existing investments in fossil fuel infrastructures are huge. According to Smil, the global network of oil and gas-fields, along with all the coal carrying vessels, oil and Liquid Natural Gas (LNG) tankers, treatment plants and refineries 'constitute the world's most extensive, and most costly, web of infrastructures'.[96]

The following extract from the UN's 2011 World Economic and Social Survey highlights the scale of the problem:

> There are thousands of large coal mines and coal power plants, about 50,000 oilfields, a worldwide network of at least 300,000 km of oil and 500,000 km of natural gas pipelines, and 300,000 km of transmission lines. Globally, the replacement cost of the existing fossil fuel and nuclear power infrastructure is at least $15 trillion-$20 trillion. China alone added more than 300 GW of coal power capacity from 2000 to 2008, an investment of more than $300 billion, which will pay for itself only by 2030-2040 and will run maybe until 2050-2060. In fact, most energy infrastructures have recently been deployed in emerging economies and are completely new, with typical lifetimes of at least 40-60 years. Clearly, it is unlikely that the world will decide overnight to write off $15 trillion-$20 trillion in infrastructure and replace it with a renewable energy system having an even higher price tag.[97]

An unwillingness to write off such investments leads to inertia. As David Harvey shows in *Limits to Capital*: 'When capitalists purchase fixed capital, they are obliged to use it until its value (however calculated) is fully retrieved'.[98] And as Malm notes, this is not simply about recuperating expenses:

> …once a power plant has paid back, the owning firm will be wise not to knock it down, but rather keep it in operation for as long as possible. Already paid for, it can now be treated as

[93] *Fortune 500: Full List* (2017).
[94] Klein, *This Changes Everything*; Damian Carrington, '"Shell knew'" oil giant's 1991 film warned of climate change danger', *The Guardian* (28 February 2017).
[95] Birgit Mahnkopf, 'Lessons from the EU: why capitalism cannot be rescued from its own contradictions', in: Dale *et al., Green Growth*, pp. 145-6.
[96] Vaclav Smil, *Energy Transitions: History, Requirements, Prospects* (Oxford: Praeger, 2010), pp. 125-6.
[97] United Nations, *World Economic and Social Survey* (2011), p. 53.
[98] David Harvey, *Limits to Capital* (London: Verso, 1999), p. 220.

> costless fixed capital and used a base for capturing larger market shares; decommissioning the complex and constructing another would be to start all over again.[99]

While fossil fuel corporations are hugely powerful, they are, however, not invulnerable. As Warlenius notes:

> Capitalism has always developed through phases of destruction and phases of creation, and the substitution of one technology or energy regime for another might be a threat to jobs, firms, even to people, towns and landscapes, but not necessarily a threat to capital as such, since it will relocate to expansive, profitable sectors.[100]

Indeed, Holgersen and Warlenius suggest that the 'creative destruction' of fossil fuel infrastructure could pave the way for the resolution of both the economic and climate crises. For the former, capital must be destroyed; for the latter, fossil fuel infrastructure must be demolished. However, the difficulty comes – particularly when one considers the dense web of links between fossil fuel corporations and capitalist states – in ensuring that the 'right' type of capital is destroyed. [101]

Their argument, however, assumes that renewable energy sources *will be sufficient to drive the capitalist economies that emerge* – a claim questioned above; they also prioritise climate change over other ecological considerations. This stance constitutes what I call a 'weak' conception of green development.

2) Power and decentralisation

Renewable energy lends itself to local, decentralised production and distribution. This is considered a virtue by many.[102] However, as Warlenius notes, such thinkers would be naïve to assume that this decentralised vision is shared by capital or social elites.[103]

In terms of geopolitical leverage, as no single country can dominate the source of solar energy, it cannot be weaponized as an imperial tool.[104] And although locally-based production would eliminate the need for much of the centralised grid system, minimise transmission losses, and help manage supply and demand, the market domination of a few energy companies 'leads to a preference being given to central, grid-based approaches that retain their market power (offshore wind parks, nuclear energy and project proposals for huge solar power generation facilities)'.[105]

For Warlenius, such considerations make it:

> …hard to imagine industrial capitalism, based on competition, commodification and monopolization, willingly adopting an energy system based on a decentralized network of rather cheap and low-tech devices generating electricity from wind, water and sun... Probably

[99] Andreas Malm, 'Socialism or barbeque, war communism or geoengineering: some thoughts on choices in a time of emergency', in: Eskelinen *et al.* (eds.) *Politics of Eco-socialism,* p. 181.
[100] Warlenius, 'A renewable energy transition', p. 87.
[101] Ståle Holgersen, Rikard Warlenius, 'Destroy what destroys the planet: Steering creative destruction in the dual crisis', *Capital & Class*, 40:3 (2016), 512; cf. Klein, *Shock Doctrine,* p. 316.
[102] e.g. Jeremy Rifkin, *The Third Industrial Revolution: How Lateral Power is Transforming Energy, the Economy, and the World* (New York: Palgrave Macmillan, 2011).
[103] Warlenius, 'A renewable energy transition', p. 91.
[104] George A. Gonzalez, *Energy and Empire: The Politics of Nuclear and Solar Power in the United States* (Albany: SUNY Press, 2012), p. 8.
[105] Hoffman, 'Can green growth really work', p. 35.

> the concentrated ownership of capital will fetter the development of such a decentralized energy system, whose full potential could only be developed under different circumstances.[106]

3) The neoliberal conjuncture: bad timing

As Malm points out, the hyper-globalised economy of the current conjuncture can only be understood as a 'most unpropitious moment… for embedding the world's energy system in the spatial and temporal matrix of wind, water and sun'.[107]

Given neoliberalism's (ostensible) aversion to state intervention, as well as to any forms of potentially profit-inhibiting regulation,[108] politicians operating within the limits of its normative frame are far from ideally placed to deal with the climate crisis (let alone ecological crises more broadly).[109] For Warlenius, this is a classic case of 'bad timing':

> …a deal on climate change agreed under the Fordist era would probably have adopted measures and policies that would have mitigated climate change more effectively… [Such a course of action, however, would be] regarded as economically 'inefficient' by today's neoclassical economists.[110]

Carbon emissions have exploded under neoliberalism – and taking account of current trends, as an accumulation regime neoliberalism appears incapable of dealing in any meaningful way with the climate crisis.[111]

This inability need not necessarily create a problem for neoliberal accumulation, however. Indeed, the multiple environmental crises we face present potential opportunities for a new wave of innovation and neoliberal expansion.[112] Examples include carbon markets, payments for ecosystem services (PES) and the commodification of nature, insurance and climate finance mechanisms (for example 'catastrophe' bonds), renewable technologies, geoengineering, electric vehicles, green chemistry, and green nanotechnology, to name just a few.[113]

Advocates of market-based solutions to ecological crises are quick to point to the recent expansion of renewable energy capacity as evidence of the unparalleled mobilising force of neoliberal regimes.[114] Indeed, on current trends, such renewable capacity is set to increase markedly in coming decades. Yet due to the inner logic of capitalist production, rather than *displacing* production based on fossil fuels, new renewable energy capacity is augmenting existing energy supply. Richard York analysed data from across most nations of the world during the period 1960-2009 and found that each unit of total national non-fossil energy displaced less than one-quarter of a unit of fossil energy; regarding electricity in particular, each unit of non-fossil fuel-generated electricity displaced less than one-tenth of a unit of electricity generated from fossil fuel sources. These results, he suggests, 'challenge

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[106] Warlenius, 'A renewable energy transition', p. 97.
[107] Andreas Malm, 'The origins of fossil capital: from water to steam in the British cotton industry', *Historical Materialism*, 21:1 (2013), 61.
[108] Philip Mirowski, *Never Let a Serious Crisis go to Waste: How Neoliberalism Survived the Financial Meltdown* (London: Verso, 2013); David Harvey, *A Brief History of Neoliberalism* (Oxford: OUP, 2005).
[109] Klein, *This Changes Everything.*
[110] Warlenius, 'A renewable energy transition', p. 95.
[111] Malm, *Fossil Capital,* p. 359.
[112] The Natural Edge Project, *Waves of Innovation* (2004).
[113] Harvey, *Seventeen Contradictions*, p. 248; Razmig Keucheyan, *Nature is a Battlefield* (Cambridge: Polity, 2016).
[114] Howard Johns, *Howard Johns: Energy Revolutionary and Solar Entrepreneur* (2015).

conventional thinking in that they indicate that suppressing the use of fossil fuel will require changes other than simply technical ones such as expanding non-fossil-fuel energy production'.[115]

We are brought once again to the environmental problematics rooted in capitalism's inner logic. Production takes place with the primary aim of capital accumulation. Consequently, new renewable energy capacity is put in service of this goal. And as there exist no real boundaries between 'green', 'grey' or 'black' capitalist sectors, money invested in 'green' sectors might produce profits that are later invested in 'black' sectors.[116] Profit is the 'bottom line'; environmental concerns are cast aside.

4) Material resources

Renewable energy systems require large amounts of earth materials. The development of a global renewable energy system and the electrification of transport would require 50%of current copper reserves; regarding platinum, nickel and lithium, the need would be larger than (or a large proportion of) respective existing reserves.[117]

According to Mahnkopf, due to decreasing discovery rates, major minerals – silver, lead, copper, nickel, uranium – at acceptable prices are set to become exhausted between 2030 and 2050. Lower grade ores require relatively more energy for extraction. Also, due to the ecological impacts of mining, mining corporations in many places around the world are facing increasing levels of resistance.[118] Such issues pose problems for the development of a global renewable energy system.

And whether capitalist or not, any future social formation that increases renewable energy capacity to deal with atmospheric carbon emissions will likely amplify other ecological stresses. While the impacts of solar energy production, for example, might be milder than those of fossil energy, in an expanding economy the total amount of energy produced, and the materials extracted, will sooner or later overshadow such differences. Kallis warns that if world energy consumption was to triple by expanding renewable energy capacity, the impact of materials extracted and land used would 'become a major force of environmental degradation and pollution'.[119] Could a major shift to renewables signal the return of 'the land constraint' in 21st century form?

These issues constitute significant obstacles to those who propose to power the 'green' capitalist economies of the future entirely by renewable energy sources. For Kallis, this problematic brings forth the issue of 'de-growth': although powering the global economy of today entirely by renewable energy is unlikely, it is possible, he suggests, 'to thus power a much smaller one'.[120]

Part III

[115] Richard York, 'Do alternative energy sources displace fossil fuels?', *Nature Climate Change*, 2 (2012), 441-3.
[116] Holgersen, Warlenius, 'Destroy what destroys the planet'.
[117] Antonio García-Olivares, Jordi Solé, 'End of growth and the structural instability of capitalism – from capitalism to a symbiotic economy', *Futures*, 68 (2015), 31-43.
[118] Birgit Mahnkopf, 'Lessons from the EU: why capitalism cannot be rescued from its own contradictions', in: Dale *et al., Green Growth*, p. 145.
[119] Kallis, 'Socialism without growth', 4.
[120] Kallis, 'Socialism without growth', 6.

Green growth, political strategy and ecologically sustainable transition: 'green growth' or 'de-growth'?

Recently, debates regarding the very possibility of 'green growth' have intensified following the (re-)emergence of Green New Deal (GND) thinking in the US.[121] The GND's increasing political traction – in large part a reaction to the anti-ecological intransigence of the Trump administration at a time of increasingly evident climate breakdown– has pitted defenders of 'green Keynesian' ideas such the GND against those demanding not 'green growth' but 'de-growth' as the socio-economic means by which to ensure planetary salvation.[122]

Before going further, we must note that, despite some major differences between the various strains of green Keynesian and de-growth thinking, there also exists significant common ground. For instance, it would be possible to create more 'green' jobs in renewable energy (a typical ingredient of green Keynesian approaches), whilst reducing working time for *individual* employees (a common demand of de-growth advocates).

Consequently, drawing crude, clear-cut distinctions between de-growth and green Keynesian positions is ill-advised. However, given that such a move is helpful in terms of initially setting out the terrain of debate, it is in this manner that I will proceed. Doing so will enable us to consider the key possibilities and limitations associated with each perspective, and thus will allow us to establish some potential advantages (considered from the viewpoint of those seeking ecologically sensitive social transformation) of a middle way position founded on a more qualitative conception of growth than that frequently employed in the de-growth literature.

Green Keynesian approaches

While there are many Keynesianisms (neoclassical synthesis, post-Kensianism, etc.), we will consider as green Keynesian those approaches that combine Keynesian fiscal policies with environmental aims in an effort to resolve both 'unemployment problems and ecological problems through a single policy framework'.[123] Such policies typically seek to boost employment (and therefore demand) by 'greening' basic infrastructure.[124]

A major tension evident in green Keynesian approaches, however, relates to traditional Keynesianism's emphasis on growth and the increasingly evident ecological limits to growth.[125] A key challenge for those advocating green Keynesian approaches, then, relates to the question: *to what extent can this growth be 'greened'*?

The rapidly rising US GND movement draws on green Keynesian ideas. Driven by groups such as the Justice Democrats and the Sunrise Movement, this socialist-inflected Green New Deal variant is gaining political traction as a potential solution to pressing

[121] Interest in the Green New Deal concept is also gaining momentum in other settings, including the UK.
[122] See, e.g.: Kallis, 'Socialism without growth'; Serge Latouche, *Farewell to Growth* (Cambridge: Polity, 2009); Jonathan Neale, 'Climate politics after Copenhagen', *International Socialism Journal*, 126 (2010); Troy Vettese, 'To freeze the Thames', *New Left Review*, 111 (2018), 63–86.
[123] Jonathan M. Harris, 'Green Keynesianism: beyond standard growth paradigms', *Global Development and Environment Institute Working Paper*, 13:2 (2013).
[124] Teppo Eskelinen, 'Possibilities and limits of Green Keynesianism', in: Eskelinen *et al.* (eds.), *Politics of Eco-Socialism*, p. 102.
[125] Harris, 'Green Keynesianism'.

environmental, economic and social problems. Indeed, the idea is currently supported by several leading Democratic candidates for the 2020 presidential election.[126]

The programme can be considered relatively ambitious. According to Representative-Elect Alexandria Ocasio-Cortez, a key figure driving the resurgence around the GND, the policy is set to be 'the New Deal, the Great Society, the moon shot, the civil-rights movement of our generation'.[127]

Proposals centre around a mass public works programme oriented towards rapid decarbonization of the US economy: the aim is to develop a national energy system based on 100% renewable energy within 12 years. It is founded on a federal job guarantee offering work with a 'liveable wage' and health insurance for all who want it.[128]

Other demands include the recognition of labour rights and union representation, and a just transition with protections for low-income communities, communities of colour, indigenous communities and those adversely affected by climate change and environmental pollution . To help fund this programme, key figures associated with the movement are demanding tax increases for the rich.[129] Perhaps unsurprisingly, these suggested tax increases have been fiercely attacked by Republican critics; the programme has also faced criticism for the role played by the controversial Modern Monetary Theory (MMT) in GND financing.

The scale of the programme and its increasing political traction clearly represents a threat to embedded elements within the fossil-capital nexus in the US. Consequently, the GND movement has faced, and continues to face, significant resistance from such quarters.[130] Yet opposition has emerged not only from those intent on protecting fossil-capital interests, but also from sections of the environmentalist left – in particular from advocates of de-growth.

De-growth

The de-growth movement brings together a diverse range of tendencies, each emphasising different issues: GDP, consumption, work-time, physical degrowth, etc.[131] All, however, tend to coalesce around the view that 'growth is uneconomic and unjust, that it is ecologically unsustainable and that it will never be enough'.[132]

This stance sits squarely at odds with the orthodox economic view that continuous growth is both possible and desirable – and that its achievement constitutes a panacea for all

[126] Cameron Cawthorne, 'Ocasio-Cortez: "Every Democratic presidential candidate" supports Green New Deal', *Washington Free Beacon* (16 February 2019).
[127] Robinson Meyer, 'The Democratic Party wants to make climate policy exciting', *The Atlantic* (5 December 2018).
[128] Katrina vanden Heuvel, 'Why the time has come for a Green New Deal', *The Washington Post* (18 December 2018).
[129] Matthew Choi, 'Ocasio-Cortez floats 70 percent tax on the super wealthy to fund Green New Deal', *Politico* (4 January 2019); Matthew T. Huber, 'Building a "Green New Deal": lessons from the original New Deal', *Verso Blog* (19 November 2018).
[130] Dean Obeidallah, 'The right is slamming the Green New Deal, and Democrats need to react fast', *CNN* (18 February 2019).
[131] Giacomo D'Alisa, Federico Demaria, Giorgos Kallis (eds.), *Degrowth: A Vocabulary for a New Era* (Oxford: Routledge, 2015); Jeroen C.J.M. van den Bergh, 'Environment versus growth — A criticism of "degrowth" and a plea for "a-growth"', *Ecological Economics,* 70:5 (2011), 881–90.
[132] D'Alisa *et al.* (eds.), *Degrowth*, p. 6.

social ills.[133] Advocates of de-growth tend to stress the need for 'sustainable de-growth'. This, it is suggested, should not be considered solely in terms of negative GDP growth (a phenomenon that already has a name: 'recession, or if prolonged, depression'.[134] Instead, this involves an 'equitable downscaling of production and consumption that will reduce societies' throughput of energy and raw materials'.[135] This focus on throughput is important, suggests Kallis, as:

> In any meaningful understanding of the term, 'economic growth' signals an increase of material [living] standards.[136]

This is because:

> Growth in the material standard of living requires growth in the extraction of materials. This is unavoidably damaging to the environment and ultimately undermines the conditions of production and reproduction. There is no silver-bullet technology that can make an increase in the material standard of living immaterial.[137]

On this view, reducing ecological impact requires a reduction in material and economic throughput. For Kallis, this is incompatible with GDP growth – and indeed throughput de-growth will likely lead to a decline in GDP.[138]

Therefore, suggests Kallis, what is required is a way to make the 'inevitable – and desirable – economic (GDP) degrowth… socially sustainable… It is a vision of a smooth process of downshifting the economy through institutional changes, managing collectively a 'prosperous way down'.[139]

However, as many critics of de-growth perspectives note, devising a way forward that is socially sustainable is one thing – yet it is something entirely different to incorporate such demands for social sustainability into a programme that is *politically viable*. This issue we will return to below. First it is necessary to take a critical look at green Keynesianism.

Green Keynesianism: critical perspectives

As noted above, a central ecological critique of green Keynesian approaches relates to the detrimental ecological impacts associated with increased levels of employment and, therefore, demand.[140] According to Jackson, this relationship between employment and consumption indicates that:

> …the default assumption of even the 'greenest' stimulus package is to return the economy to a condition of continuing consumption growth. Since this condition is unsustainable, it is difficult to escape the conclusion that in the longer term something more is needed.[141]

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[133] Dale, 'Growth paradigm'.
[134] Giorgos Kallis, 'In defence of degrowth', *Ecological Economics,* 70:5 (2011), 874.
[135] François Schneider, Giorgos Kallis, Joan Martinez-Alier, 'Crisis or opportunity? Economic degrowth for social equity and ecological sustainability. Introduction to this special issue', *Journal of Cleaner Production,* 18:6 (2010), 512.
[136] Kallis, 'Socialism without growth', 5.
[137] Kallis, 'Socialism without growth', 2.
[138] Kallis, 'Socialism without growth', 4.
[139] Kallis, 'In defence', 875; quoting: Howard T. Odum, Elisabeth C. Odum, *A Prosperous Way Down: Principles and Policies* (Colorado: UP of Colorado, 2001).
[140] Wainwright, Mann, *Climate Leviathan*, p. 120.
[141] Tim Jackson, *Prosperity without Growth: Economics for a Finite Planet* (London: Earthscan 2009), p. 104.

From an ecological sustainability point of view, Jackson's doubts are not without foundation. Note, for example, the emphasis placed on increased consumption in the *Green New Deal Group*'s influential 2008 report:

> Any (Green New Deal) public spending should be targeted so that domestic companies benefit, and then the wages generated create further spending on consumer goods and services… workers' salaries are spent on food, clothes, home entertainment, the theatre and so on, creating demand for those industries.[142]

A common defence offered in response to this line of criticism stresses the possibilities associated with shifting economic activity from production of goods to services.[143]

Yet this suggestion can be found wanting on at least two counts. First, while it might indeed be possible to re-orient a given (national) economy away from manufacturing goods towards service-based activity, this need not necessarily be accompanied by a reduction in levels of domestic consumption (and therefore overall material throughput). Instead, environmentally harmful production processes may simply be exported to other national economies, which in turn export their (semi-)finished goods to the countries in question. While a domestic economy may appear, then, to be de-materialising, this process is predicated on 'supermaterialisation' at the macro scale.[144].

Second, those who advocate shifting production from goods to services tend to assume that service-based economic activities are immaterial (or at most have a very light ecological footprint). While of course hairdressing may be less ecologically harmful than steelmaking, service-based economic activities still require a material basis – therefore their continued growth has detrimental ecological consequences.[145]

Another key limitation of Green Keynesian approaches (and an issue of particular importance given the nature of the argument I set out below) is the "top-down" nature of their political decision-making processes. For Wainwright and Mann, this dynamic forecloses the development of radical political alternatives. Keynesian approaches, they suggest, can only:

> …further concentrate power and resources in the hands of elites – the technocratic and economic groups with the knowledge and power to carry it out – thus rendering us even more beholden to the political status quo upon which those elites rely.[146]

Their view is supported by Eskelinen, who notes that Keynesian approaches say little about power relations in production, and that they typically overlook privileges rooted in

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[142] Green New Deal Group, *A Green New Deal: Joined-up policies to solve the triple crunch of the credit crisis, climate change and high oil prices* (London: New Economics Foundation, 2008), p. 27.
[143] Fred Block, 'Crisis and renewal: the outlines of a twenty-first century new deal', *Socio-Economic Review,* 9:1 (2011), 31–57.
[144] Dale *et al.* (eds.), *Green Growth*, p. 9; David A. Sonnenfeld, 'Contradictions of Ecological Modernization: Pulp and paper manufacturing in Couth-East Asia', in: Mol *et al.* (eds.) *Ecological Modernisation Reader*, pp. 386-7.
[145] Wainwright, Mann, *Climate Leviathan,* p. 120. Hairdressing is a frequently invoked example of a supposedly immaterial entity that has significant detrimental ecological impacts is Bitcoin.
[146] Wainwright, Mann, *Climate Leviathan,* p. 121.

established ownership patterns – omissions that tend to leave existing class relations intact.[147]

Environmental critics of green Keynesian approaches tend to consider such factors inherently limiting in terms of instigating processes of meaningful socio-ecological transformation. However, green Keynesians are able to suggest precisely the opposite: it is the relative compatibility between their proposals and the currently dominant political-economic ideas that makes their translatability into concrete political action more likely.[148]

For many advocates of green Keynesian ideas, however, the same cannot be said of de-growth proposals – which, the argument goes, offer little insight into *how* to foster the social and political changes required for the enactment of a programme of rapid, radical socio-ecological change.[149]

De-growth: critical perspectives

For thinkers such as Pollin, Foster and Schwartzman, this deficiency is rooted in an inadequate conception of growth itself. Pollin suggests that de-growth thinkers tend to present 'broad generalities' about economic growth that result in crude demands for 'blanket' de-growth.[150] It is a view is shared by Schwartzman, who criticises de-growth thinkers for prioritising the quantitative, rather than qualitative, aspects of growth. He suggests that:

> The concept of economic growth should be deconstructed, with in-depth consideration of its qualitative versus quantitative aspects, particularly its differential ecological and health impacts. Growth of what are we asking? Weapons of mass destruction, unnecessary commodities, SUVs versus bicycles, culture, information, pollution, pornography, or simply more hot air? What growth is sustainable in the context of biodiversity preservation and human health, and which is not?[151]

Emphasising the *form* of growth (its qualitative nature) offers a means by which to overcome what many characterise as the green growth vs de-growth dichotomy. It also provides a foundation for the development of an emancipatory ecological politics *based on green growth*.

This is not to deny the need from an ecological sustainability standpoint for an overall reduction in material and energetic throughput – a key concern if we are to remain within planetary limits. This qualitative conception, however, does open up space for thinkers such as Pollin to argue for growth in *some* categories of economic activity (i.e. clean energy infrastructure development), alongside *a rapid contraction in others* (the fossil fuel sector, for instance).[152]

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[147] Eskelinen, 'Possibilities and limits', p. 112. However, it is necessary to note that by boosting employment, Keynesian approaches can work to strengthen the position of labour vis-à-vis capital: Michał Kalecki, 'Political aspects of full employment', *Political Quarterly* 14:4 (1943).
[148] Eskelinen, 'Possibilities and limits'.
[149] John Bellamy Foster, 'Capitalism and Degrowth: an impossibility theorem', *Monthly Review*, 62:8 (2011), 26-33; Neale, 'Climate politics'; Robert Pollin, 'Green Growth vs a Green New Deal', *New Left Review*, 112 (2018), 5–25.
[150] Foster, 'Capitalism and Degrowth'; Pollin, 'Green Growth'.
[151] David Schwartzman, 'A critique of degrowth and its politics', *Capitalism Nature Socialism*, 23:1 (2012).
[152] Pollin, 'Green Growth', 7-8; Dale, 'Growth Paradigm'; Neale, 'Climate politics'.

This approach offers a way to potentially sidestep the severe social dislocation typically associated with sharp declines in growth. While such economic contractions can have beneficial ecological effects, they typically lead to mass unemployment and declining standards of living – particularly for working people and the poorest in society.[153] It is for this reason, Pollin argues, that strategies founded on the de-growth concept will find little public political support – and therefore must be rejected.

It is a sentiment with which Neale and Dale agree. To build an ecological movement with the social power necessary to drive radical socio-economic change, Neale argues that political demands must centre not on sacrifice and *reductions* in growth, but on 'decent living standards, jobs and *growth of a very particular kind*'.[154]

This is not to suggest that sacrifices are completely unnecessary. Instead, argues Dale:

> …*certain* sacrifices are needed: for instance on the part of frequent flyers, SUV owners, or eaters of beef. These would disproportionately, but not exclusively, affect the wealthy.

However, growth must not be conceived in the abstract, but in determinate, qualitative terms (linked to questions of the form of society). The struggle then becomes one *not simply for green growth*, but for:

> …climate jobs, street by street refurbishment of buildings, additional bus routes and tram lines, solar panels, public healthcare, and so on. In the Global South the list could be extended to include electricity supply for the 1.6 billion people who lack it, an end to back-breaking work, and the installation of sanitation and water systems. [155]

Foster similarly dismisses a conception of growth considered in the abstract – a viewpoint he strongly associates with de-growth thinking. He instead emphasises the need to focus on:

> …*deaccumulation*—a transition away from a system geared to the accumulation of capital without end [emphasis added].

He does not, however, reject outright the importance of de-growth. But he does argue that, while economic growth may be the 'main driver of planetary ecological degradation', the concept of de-growth can only take on genuine meaning:

> …as part of a critique of capital accumulation and part of the transition to a sustainable, egalitarian, communal order; one in which the associated producers govern the metabolic relation between nature and society in the interest of successive generations and the earth itself (socialism/communism as Marx defined it).[156]

In terms of political strategy, by bringing together the work of Pollin, Neale, Dale and Foster, we can suggest that concrete proposals – renewable energy infrastructure projects, energy efficiency programmes, improving public transport networks etc. – *could* constitute the initial phase of what Foster has called a 'two-stage strategy for ecological and social revolution'.[157] This first stage focuses on actions possible under present-day conditions – yet that run counter to the logic of capital accumulation. Such activities can generate the

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[153] Pollin, 'Green Growth', 22.
[154] Neale, 'Climate politics'.
[155] Dale, 'Growth paradigm'.
[156] Foster, 'Capitalism and degrowth'.
[157] John Bellamy Foster, 'Marxism and ecology: common fonts of a Great Transition', *Great Transition Initiative* (October 2015).

conditions necessary for the second, eco-socialist phase of transformation that Foster ultimately advocates (there are connections here with Gorz's conception of structural reforms[158]).

Like Foster, Vergara-Camus considers the transition to socialism necessary for long-term ecological protection. For him, this transition would necessarily entail the abolition of capital accumulation as the dominant organising logic of society. In his vision of socialism, the consumer choices of labourers would be determined by 'democratically decided and ecologically informed objectives' in a way that could allow such a society to '…grow in certain times and degrow in others (depending on the satisfaction of needs and the available technology)'.[159] Clearly, if one accepts the arguments set out above, such an agenda is inconsistent with the logic of capitalist production – no matter how ostensibly green. Instead, as Dale sets out, it would require a context where:

> …not capital but need determines what is produced and how[160], in which not profit but the quality of life is the defining purpose of social labour, and in which the planet's resources and the natural environment are handled with care.[161]

This vision would not appear out of place in the de-growth literature. However, if one accepts the criticisms of de-growth set out above, then perhaps demands for a *certain type of (green) growth* can better inform the development of a political strategy that, in the longer term, will develop the social forces necessary to make meaningful de-growth a genuine possibility.

Conclusion

The primary aim of capitalist production is the accumulation of capital. Capitalist social formations require constant growth – and as this growth (even when ostensibly green) is inherently ecologically destructive, we can conclude that any future 'green' capitalist accumulation regime will eventually hit the limits of nature. A 'green' capitalism in any meaningful sense, then, is a contradiction in terms.

While it might be possible *in theory* to envisage a capitalist social formation that is powered entirely by non-fossil energies, there is little empirical evidence to suggest that such a prospect is pending. As a result of the advantages fossil fuels provide, they remain a central element in capitalist production. Despite current trends showing large increases in renewable energy capacity, the inner logic of capitalism ensures that these new de-carbonized energy systems only supplement existing fossil-based supply in service of capital accumulation. What's more, the expanded production of these new renewable energy systems will amplify other ecological rifts. As the window of opportunity for action on climate change closes, this situation is a cause for concern. It is clear, then, that a truly sustainable future – one focused on a social metabolism geared to sustainable human development[162] – must be one *beyond* capitalism.

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[158] André Gorz, 'Reform and revolution', in: Greg Albo, Leo Panitch, Alan Zuege (eds), *Class, Party, Revolution: A Socialist Register Reader* (Haymarket: Chicago, 2018).
[159] Leandro Vergara-Camus, 'Capitalism, democracy, and the degrowth horizon', *Capitalism Nature Socialism* (2017), 11.
[160] In Marxist terms, we can state that this is the prioritization of use-value over exchange-value: Marx, *Capital,* vol. 1.
[161] Dale, 'Growth paradigm'.
[162] Foster, 'Marxism and ecology: common fonts'.

However, while I object to the notion of 'green capitalism', it may be possible to pursue an ecologically-sustainable political programme that includes 'green growth' – if one accepts that this can only occur in certain sectors (green energy infrastructure, public transport, etc.) and at particular times as demanded by ecologically-informed social need. This growth must be compensated for by rapid de-growth in ecologically destructive sectors (fossil fuel production, private vehicles, military activity, unnecessary consumption etc.).

Such priorities require a social context in which effective, deeply democratic institutions are firmly embedded and where production is oriented not towards constant capital accumulation, but social need. This vision is incompatible with the priorities that drive capitalist social formations, and instead speaks to socialist demands.

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