As Climate Crisis Worsens, the Case for Eco-socialism Strengthens

Dialectical resolutions of environmental justice and ecological modernization

November 2021 by **Patrick Bond**

A fierce intellectual battle continues over the ideological character of green politics. The overall conflict that emerged in past decades between environmental justice advocates on the one hand, and on the other, a coalition of states, corporations and their academic, NGO and media allies will now revive in earnest, given the Biden Administration's January 2021 pledge to take climate change seriously. After the Trump regime's climate denialism, a longstanding challenge to environmental justice now returns in the form of supposedly-pragmatic "ecological modernization" strategies, i.e., regulatory, technicist, market-based (applying "marginally" so as to incentivize next-step decision-making instead of dramatic transformations) or some combination. These characterized the pre-Trump era but had no discernable impact on emissions. In contrast, one Marxist committed to resolution of the tension thus created – between orthodox approaches and left, indigenous, feminist, community and anti-racist "climate justice" politics – David Harvey – has long advocated "radicalization of the theses of ecological modernization." The temptation that must be avoided in this process, though, is *deradicalization* through cooptation, e.g., through adoption of "false solutions," including carbon sequestration. But even as technical questions reemerge – especially over "net carbon zero" fantasies of putting CO2 "back underground" – the radicalization Harvey calls for becomes ever more relevant. On the one hand this often appears impossible, such as in the debate over emissions trading, where an "internalizing externalities" strategy through markets is again being contested by critical activists across the world, at the same time corporate net neutrality has become all the rage for ecological modernizationists. Tellingly, carbon markets and offsets have recently revived since 2018, just as financial speculation soared, pumped up by Covid-induced Quantitative Easing. On the other hand, "climate reparations" for "loss and damage" – via "ecological debt" payments and/or sophisticated versions of carbon taxation – are entirely reasonable financial accounting techniques that require more careful application so that "climate action" political strategy does not lead (as in the mainstream model) to an unjust "privatization of the air" and ultra-commodified "Payments for Ecosystem Services." As eco-socialists mobilize against fossil fuels and, in doing so try to avoid eco-social fragmentation (especially labor versus environmentalists), Harvey's provocation offers an opportunity to establish what kinds of dialectical processes might constructively arise. In the South African case, for instance, ongoing environmental justice demands are grounded in eco-feminist *Ubuntu*, "commoning", and "rights of future generation" concepts. But can their advocates radicalize the technicist analysis they are daily confronted with, by utilizing ecological modernization approaches (e.g. to assess climate debt and to advocate anti-extractivist policies through invoking "natural capital accounts"), in search of a resolution that in turn provides new eco-socialist potentials – and further contradictions?

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1. Introduction

David Harvey (1996, 2020a) encourages us to revisit the climate crisis – and potential solutions – by considering fruitful tensions between "environmental justice" and "radicalized ecological modernization." [1] While long-standing progressive critiques of capitalist geoengineering should continue (e.g. Sapinski, Buck and Malm 2020), how might a dialectical line of argument, and a corresponding eco-socialist political agenda, logically unfold? As he confessed, Harvey's (2020a, 60) conversion to the view that greenhouse gas emissions now threaten humanity and other species came extremely late, only in an "Anti-Capitalist Chronicles" podcast in July 2019: "I've always taken the view that we should take environmental questions seriously but I have been profoundly skeptical of apocalyptic scenarios and visions. But that really changed when I saw that 400 parts per million (ppm) of carbon dioxide concentrations against the background that nothing above 300 ppm had been seen for the last 800,000 years."

The ensuing crisis, he argues, now requires extreme technological intervention – including wide-ranging CO2 sequestration – in a manner that would upend nearly all radical climate activists' strategies, which have in contrast mainly been based upon mitigation, i.e., dramatically reducing greenhouse emissions at source and confronting not only high-carbon cheap technology but the billion or so super-polluters' unsustainable lifestyles. Instead, Harvey (2020a, 61) continues,

> The carbon we are taking out from underground needs to be put back underground if we are to return to a world of 300 ppm. It was originally put underground by vegetation, and to some degree crustaceans. We've taken all of that stored energy from underground and now released it. We now need to talk seriously about getting that 400 back down to 300 ppm and the only way we can do that is by finding means of getting the carbon dioxide out of the atmosphere and back underground.

This framing raises the narrow problem – and even narrower solution – of what sort of *technical fix* can be found for the climate crisis. David Schwartzman (2020) makes a similar case for "massive industrial sequestration of carbon dioxide from the atmosphere into the crust," which he considers to be "absolutely imperative… implemented along with the obvious requirement for early and radical reductions in emissions." (He favors underground injection of CO2 to combine with water and mafic basalt rock as "the most promising carbon sequestration approach"; see also Schwartzman and Schwartzman, 2019.)

Strategies to sequester CO2 include three types: first, natural approaches such as afforestation, reforestation and restoring coastal and marine habitats, e.g. the rewilding favored by George

Monbiot (2021); second, enhancing nature's sequestration strategies through land management (e.g., adding biochar or mineral silicate to soil, or introducing genetically-engineered trees and plants) or ocean fertilisation (adding nutrients such as iron filings to raise CO2 absorption); and third, carbon capture and storage either through bioenergy, industrial scrubbers on smokestacks or direct air capture, using geological features to store CO2 underground. The latter burial strategies are still infeasible, however, with only four genuine pilot projects underway (Frietas and Jones 2020). The Intergovernmental Panel on Climate Change (2018), which refused to project sequestration potential for unproven technologies, did identify 1-11 billion tons of CO2-equivalents/year that could be removed (by 2050) using the first two strategies, and up to 8 billion through bioenergy sequestration – a substantial share of anticipated emissions given that today 50 billion tons are emitted annually across the world.

A variety of other geoengineering strategies beyond sequestration include solar reflection through releasing sulfer aerosols, constructing orbital mirrors and sunshades, whitening clouds with dissolved seawater salts from sea-borne vessels and introducing (high-albedo) ultra-white cooling paints that reflect back 98 percent of light. Other technologies being repurposed or introduced for energy consumption include nuclear and green hydrogen. These are eco-modernization techniques, advocates insist, that can be introduced through market mechanisms and incentives, and that would solve the climate crisis.

At first blush, the eco-modernizationist approach appears entirely inured to influence by the careful, long-term, anti-capitalist thought and activism that Harvey has advanced for decades. Eco-modernization is far more consistent with the world view of a Bill Gates (2021, 19) – "Show me a problem, and I'll look for technology to fix it" – or World Economic Forum (2020) "Great Reset" or similar "stratospheric-imperialists" (such as the Harvard Solar Geoengineering Research Program criticized by Surprise 2020). Does it not feed into increasingly-urgent "net carbon neutral" fantasies, in which untenable levels of ongoing greenhouse gas emissions are supposedly soon to be offset through new carbon-sequestration gimmickry? Does it not relegitimize those state and corporate strategies associated with 2015 Paris Climate Agreement incrementalism so inappropriate for this emergency, that leading climate scientist James Hansen labeled the deal "bullshit"? (Milman 2015)

In short, isn't this the techno-fix perspective pushed by ecological modernizationists wedded to rushed, top-down, market-centric, silver-bullet strategies which are generally considered by environmental justice critics to be "false solutions," expanding the very terrain of corporate power and overconsumption that caused the climate catastrophe in the first place? Or, can the two approaches be set up, carefully, in constructive opposition so as to open up new directions for eco-socialist planning (e.g. as in these pages, David Laibman 2020 suggests at the level of the enterprise)? If so, the way Helena Sheehan (2017, 39) described Friedrich Engels' dialectics has great relevance: "the natural sciences were on the point of a crisis in which there were only two choices: either the reign of chaos and incoherence or the achievement of order and coherence through dialectical synthesis."

The reign of chaos continues, in large part because capitalist markets successfully avoid internalizing their externalities, and high-emissions corporations control states sufficiently so as to prevent the required levels of eco-modernist strategies based on pricing (or offsetting) carbon, inducing technology or reducing consumption. This is because, in addition to profits acquired from exploitation of labor, there is a vast "unequal ecological exchange" which keeps capital accumulating, a factor at the very heart of new anti-imperial critiques of the system (Bond and

Basu 2021). Nancy Fraser (2021, 114) points out, "What made Manchester's factories hum was the massive import of "cheap natures' wrested from colonized lands by masses of unfree and dependent labour: cheap cotton to feed the mills; cheap sugar, tobacco, coffee and tea to stimulate the "hands'; cheap bird shit to feed the soil that fed the workers."

Capital has long identified, according to Fraser (2021, 114), "a form of "environmental load displacement' – a shift in the demands placed on biomass from core to periphery… historians of eco-imperialism are only now reckoning the full extent of this cost shifting." This reckoning requires, adds Fraser (2021, 123), not only a critique of capitalist cost-shifting to the South and to nature, but also to women, given that social reproduction "is closely imbricated with natural reproduction. For most people, most of the time, ecosystemic damages add heavy stresses to the business of caregiving, social provision and the tending of bodies and psyches – occasionally stretching social bonds to the breaking point."

Such damages, Ariel Salleh (2017, 2021) adds, amount to a variety of debts and reparations obligations, listed here as the creditor, its advocacy movement, the type of debt, and movement objectives:

- Workers – socialist movements: social debt – aim to improve pay and conditions
- Peasants & Indigenes – decolonial movements: postcolonial debt – aim to reclaim livelihood
- Women – feminist movements: embodied debt – aim to stop gendered resourcing
- Children & Youth movements: intergenerational debt – aim to survive
- Animals – animal rights movements: species debt – aim to extend human sensibility
- Nature – ecological movements: ecological debt – aim to preserve biodiversity

Whether paying reparations on such debts can ever properly take a monetized form requires a dialectical approach very different than reliance upon markets, as considered below. Regardless, eco-feminist critiques are often conceptually pathbreaking, for instance in tackling Gates (2021, 14) on the limits of his ecological modernization, including the way he justifies his foundation's (belated) 2019 financial disinvestment from fossil fuel firms:

- I don't want to profit if their stock prices go up because we don't develop zero-carbon alternatives. I'd feel bad if I benefited from a delay in getting to zero… using all the tools at our disposal, including government policies, current technology, new inventions, and the ability of private markets to deliver products to huge numbers of people.

Vandana Shiva (2021) and her Navdanya International allies object:

- While his many investments are all seemingly justified by a noble humanitarian and environmental cause, they actually allow him to impose his strategy through direct influence… to align public opinion and the media, international and state policy as well as private companies to open up new markets for his investments and promote the idea that any problem can (and should only) be solved through technology, innovation and the rules of the private market. This technological solutionism mentality is a common thread in all of the Gates Foundation's initiatives, from food and agriculture to health and climate change.

Under circumstances in which the likes of Gates dominate the policy terrain, what approaches remain for those who would link – to better oppose – the environmental, gendered, class, race and North-South features of accumulation by dispossession? How might they best confront the two central dimensions of what are now pro-capitalist ecological-modernization gambits for the climate crisis, namely technological fixes and market strategies?

2. "Uneven and sometimes contradictory ecological critiques"

A quarter-century ago, Harvey's (1996, 400-401) book *Justice, Nature and the Geography of Difference* set a profound challenge to environmental justice activists, to

- deal in the material and institutional issues of how to organize production and distribution in general, how to confront the realities of global power politics and how to displace the hegemonic powers of capitalism not simply with dispersed, autonomous, localized, and essentially communitarian solutions (apologists for which can be found on both right and left ends of the political spectrum), but with a rather more complex politics that recognises how environmental and social justice must be sought by a rational ordering of activities at different scales.

In a subsequent lecture, "Why Marx's *Grundrisse* is Relevant Today", Harvey (2020b) illustrates the mode of argument – and the need for a rational, coherent reordering at different scales – using the case of chlorofluorocarbon (CFC) emissions dangers, and the resulting 1987 Montreal Protocol CFC *ban* starting in 1996. (This strategy was *not* an offset or emissions-trading arrangement, but a ban.) It required an interface of technological change with strict global regulation:

- Refrigeration has been vital to human health in the food supply system. Urban areas would have long ago collapsed were it not for refrigeration… but refrigerators use CFCs which were interacting with other gases in the atmosphere in such a way as to create an ozone hole which allowed ultraviolet rays to harm human populations… Scientific knowledge created refrigeration. Refrigeration had the unintended consequences of increasing damage from ultraviolet rays upon human populations. So we had to do something about CFCs… so we had the Montreal Protocol… This is the kind of approach that needs to be pursued.

Examples of this approach are also found in John Bellamy Foster's (2020) *The Return of Nature*, drawing upon earlier socialists' attempts to apply Engels' dialectical method to contemporary environmental problems. Reviewing work by JBS Haldane, John Desmond Bernal and others, Foster (2020, 22) showed how these

- socialist thinkers provided systematic if uneven and sometimes contradictory ecological critiques of our present society that were crucial both in their day and ours – a legacy that we can no longer afford to do without in our age of combined ecological and social crisis… in a number of instances and for short periods of time, some of the thinkers in this broad tradition of socialism and ecology seemed to fall prey to a Promethean ecological modernism and a regressive conception of progress, which in the 1940s and early 1950s had become a dominant force on the left as well as the right. Nevertheless, the overall direction of the various socialist thinkers treated in this book was toward an ecological socialism, recognizing the pressing need for a new socioecological metabolism in the "closing circle" of the world environment.

To illustrate, Haldane drew on (and wrote a preface to) his father's 1936 *Nature* article "Carbon Dioxide Content of the Atmosphere." He concluded, Foster (2020, 397) recounts, that instead of fossil fuels, society should draw energy from hydrogen, tidal wind andhydroelectric sources: "Power would be available in vast quantities, but it would not be based on the yearly sacrifice of thousands of coal miners, and the spoiling of vast areas of what was once beautiful countryside. The nearest approach to this idea is found today in countries such as Switzerland, where water power is very abundant. In a properly organized world it will be the normal human environment." Haldane also favored afforestation and retention of nitrogen, phosphorus and potassium through improved soil management. Foster (2020, 397) remarks, "In line with ecological modernization, he insisted that there were possibilities for "farming the sea,' which would also require that efforts be devoted to the conservation of aquatic resources."

Indeed, as fish stocks have radically declined since peaking in the early 1980s, fish farming has replaced nature – but not without new contradictions emerging. The total commercial fishing take was 15 million metric tons in 1950 and rose steadily to peak and plateau at 80 million tons after 1985. With the Atlantic cod having collapsed entirely by 1992 due to overfishing, awareness soon emerged that from early 1980s' levels of 65 percent of species either over-fished or fully-fished, that ratio climbed steadily to 95 percent three decades later. (In the most vulnerable sites, such as offshore Somalia, this in turn compelled fisherfolk to turn to piracy.) As a result, artificial fish farming – aquaculture – rose rapidly, from 10 million tons annually in 1982 to 110 million by 2015. But the kinds of contradictions associated with capitalism's expansion into nature rapidly emerged: zoonotic disease threats, especially as *Streptococcus iniae* and parasites pass from fish farms to natural fish. Aquaculture-related pollution – especially fishmeal, nutrients and fecal matter – also destroy natural shore areas and fishing zones in the vicinity of the fish farms.

In short, a market-based ecological modernization strategy to farm the sea, based on the profit motive, is as contradiction-riddled as the overexploitation of nature it would replace. Just as extracting and burning underground "liquid methane from natural gas" (then endorsed by Haldane) – now known as fracking – have subsequently come to be understood not only as more climate-destructive than even coal energy (due to methane leaks), water systems and land ecologies are also poisoned.

Another example comes from the pathbreaking Irish chemist Bernal, who Foster (2020, 492) notes, advocated

- socialism as embracing progress for the entire world, with a focus on the solving of the world's most urgent problems. Although he placed his emphasis on how the scientific and technical revolution then taking place in the world could promote modernization, and therefore once again supported many of the big ecological modernization schemes that captured the imagination of the time (such as big dams and irrigation), he demonstrated growing ecological concerns. Both in *World Without War* and his shorter 1960 work, *A Prospect of Peace*, Bernal raised issues of pollution and ecological destruction, arguing for example for the displacement of coal as an energy source because of its inefficiency and the pollution it generated.

Uneven though these socialist-scientific precedents suggest, *eco-socialism* is the name of a political agenda conjoining an awareness of ecological modernization's limits, when confronted with environmental justice principles. To get there, by *invoking and transcending both*, requires

that the existing fragments of such a movement finally – and decisively – link up with each other, and now take on the broadest terrains of economy, society and environment as their mandate. Contemporary climate politics illustrate the potentials and pitfalls of this route, especially given the replacement of Donald Trump's climate denialism with the Biden Administration's "climate action" replete with all John Kerry's market-oriented, tech-fix baggage, and perhaps, too, occasional evidence of environmental justice (e.g. in the January 2021 Biden focus on Just-Transition employment or potentially at the Department of Interior led by Deb Haaland – although by June 2021, hopes had evaporated that new infrastructure investment would contain even tokenistic climate protection) (Bond 2021a).

3. Managing capitalist eco-crise – But towards eco-socialism?

Conceptual routes towards eco-socialism are vital to continue theorizing, especially in view of Harvey's acknowledgment that his prior aversion to climate catastrophism was incorrect. It is only in sites of concrete struggle that this advice – and awareness of dangers within the turn to technicism – can really be tested. So before considering activists' global climate policy advocacy, especially against market strategies and technological false solutions, and before contrasting these capitalist versions of ecological modernization with the countervailing instincts of political ecologists and social justice activists, it is useful to remind where ecological modernization theory originates, and how it applies to the climate crisis.

It was in 1996 that Harvey made this appeal to the environmental justice movement, based upon the idealistic proposition that tools used in the economically-engineered management of nature can be used to dismantle the eco-destructive capitalist master's house. Harvey (1996, 401) suggested the movement:

- reclaim for itself a non-co-opted and non-perverted version of the theses of ecological modernization. On the one hand that means subsuming the highly geographically differentiated desire for cultural autonomy and dispersion, for the proliferation of tradition and difference within a more global politics, but on the other hand making the quest for environmental and social justice central rather than peripheral concerns. For that to happen, the environmental justice movement has to radicalize the ecological modernization discourse.

To be sure, when engaging ecological modernizationists, it is important not to fall into "post-political" managerial logic, (Harvey's student) Erik Swyngedouw (2010) insists when critiquing "the reduction of the political to administration where decision-making is increasingly considered to be a question of expert knowledge and not of political position." Such an approach typifies "climate action" politics as epitomized by the UN Framework Convention on Climate Change, Al Gore and the recently revived emissions trading markets (Bond 2012; Bracking 2015). What then, could be done to radicalize ecological modernization in the interests of advancing to an eco-socialist stance on climate policy?

It is critical to distinguish the origins of the concept from some of the most irresponsible proponents of so-called ecological modernization, such as the Breakthrough Institute. As Ian Angus (2015) pointed out, Breakthrough "opposes efforts to limit greenhouse gas emissions, claiming that investment in nuclear reactors and shale gas will produce all the energy we need, and global warming will wither away as a side-effect: "The best way to move forward on climate policy is to not focus on climate at all'." Foster (2011) labeled the Institute "the leading big money, anti-green, pro-nuclear think tank in the United States, dedicated to propagandizing

capitalist technological-investment "solutions' to climate change." This sort of thinktank we need not be concerned with, for Harvey's radicalization strategy is impossible when such stances are adopted.

There is a more reputable history to ecological modernization than found in Breakthrough or its ilk. For example, the origins of the specific natural-valuation approach interrogated below are located in academic papers by economists Robert Solow (1974) and John Hartwick (1977). During the 1970s they began to calculate ecological destruction partly through an asset-measurement lens: as the depletion of "natural capital," a truly objectionable term (like "human capital" or "social capital"), but one that has gained currency. They insisted that if pollution or shrinkage of ecological wealth (e.g. minerals extraction) were to occur, it should only be permitted if benefits (profits, taxes and wages that can be counted up and down the "value chain") flow into the expansion of productive capital or human capital (education). The point, here, is *to protect the interests of future generations* who have a notional "right" to also draw down a society's natural resource base, the way "family silver" is considered the basis of responsible stewardship and sometimes even formal trusteeship (Bond and Basu 2021).

To accomplish this net positive outcome is termed "weak" *sustainability*, because it assumes the substitutability of these various capitals: the lost forms of nature are offset by reinvestments of profits into machinery, infrastructure or schooling that makes capitalism more productive. Such calculations about the "changing wealth of nations" – i.e., the natural capital dynamics within a broader "Adjusted Net Savings" for each country – occur at the World Bank within a national state as the unit of analysis (Lange et al 2018). This is inappropriate, of course, given both the intra-national character of unequal ecological exchange – typically termed uneven development – and the transnational character of ecocide, but nevertheless such aaccounting represents the present state of the art in ecological bean-counting (Bond and Basu 2021).

Correctives within this (very unradical) current of ecological modernization soon emerged. Based upon a much more realistic, pessimistic assessment of the scale of environmental crises, Robert Costanza and Herman Daly (1992) argued instead for "strong" sustainability, rejecting substitutability. "Society can allow no longer further decline in natural capital", Costanza and Daly (1992, 37) insisted, no matter if, for example, Norwegian oil extracted allows the next generation of university students to study for free, given that further fossil fuel extraction and combustion on current trajectories will undeniably be catastrophic. A much more expansive notion of the rights of future generations is required, for at minimum our objective is strong "sustainable development" in the sense used by the United Nations Brundtland Commission report, *Our Common Future*: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations 1987).

Can capitalism deliver sustainable development so defined, in either strong or weak terms? The preferred approach, in ecological-modernization theory, is "getting the prices right," with markets alone bolstered by state regulation and occasional prohibitions, plus channeling surpluses (gained from exploiting nature) into productive or educational investments. But this does not yet justify a turn to natural capital accounts, in a way that Harvey senses can be "radicalized."

To make that turn, consider the limits of the thought processes that generated the term ecological modernization when first introduced in 1984, as a series of technology-promoting environmental management strategies and policies offered by German political scientist Martin Jänicke (1984).

The World Business Council on Sustainable Development soon made this approach popular among elites when, working with UN official Maurice Strong, Swiss billionaire Stephan Schmidheiny (1992) wrote *Changing Course*. In this spirit, the World Bank (2012, 173) suggested the elimination of "sub-optimalities" in economy-environment relations, in the process seeking more extensive commodification of nature and renaming ecological modernization as *Inclusive Green Growth*: "cities and roads, factories and farms are designed, managed, and regulated as efficiently as possible to wisely use natural resources while supporting the robust growth developing countries still need."

Taking the baton for the next generation, another visionary capitalist – Deutsche Bank's Pavan Sukhdev – returned to market solutions, using the Nairobi-based UN Environment Program to market "The Economics of Ecosystems and Biodiversity" (TEEB). His strategy was to "recognize the wide range of benefits provided by ecosystems and biodiversity, demonstrate their values in economic terms and, where appropriate, capture those values in decision-making" (TEEB, 2020). As part of this environmental-economic commodification of nature, the concept of "Payment for Ecosystem Services" prices the environment so as to "value nature" and save it from capitalism's tendency to treat free environmental gifts as externalities.

The ideology was boosted in Davos, Switzerland during the Covid-19 pandemic with the World Economic Forum's (2020) Great Reset, based not only on founder Klaus Schwab's Fourth Industrial Revolution technofix hype, combining Artificial Intelligence, robotics, Big Data algorithms, biotech, nanotech and other next-generation innovations, but also on attempts to "steer the market toward fairer outcomes." The Forum (2020) believes governments should coordinate tax, regulatory, trade and fiscal policy, "create the conditions for a stakeholder economy," end fossil-fuel subsidies, build "green" urban infrastructure and incentivize industries "to improve their track record on environmental, social, and governance metrics."In this context of corporate hegemony – in which market imperfections are to be corrected not through regulation but through market solutions – and multiple ongoing forms of capitalist crisis, is there any scope at all for "radicalizing ecological modernization"?

4. Dangerous revivals of emissions trading, but emerging potentials for climate debt acounting

The purest form of the green-market ideology is the current promotion of emissions markets as a means of better distributing the costs of making capitalism sustainable. Recall the infamous 1991 memo by World Bank Chief Economist Larry Summers justifying trade in pollution: "The economic logic behind dumping a load of toxic waste on the lowest-wage country is impeccable and we should face up to that." Summers' (1991) analysis was cringe-worthy clumsy, and when testifying before the Senate (to be Bill Clinton's Deputy Undersecretary of the Treasury) in 1993, Summers was uncharacteristically humble:

- When I make a mistake, it's a whopper. The memo was drafted in my office at the World Bank as a comment on a research paper that was being prepared by part of my staff at the World Bank. As drafted, the memo sought to clarify the strict economic logic by using some rather inflammatory language, not to make any kind of policy recommendation. And I obviously reviewed the memo inadequately before I signed it. It made no attempt and was never intended in any way as a serious policy recommendation. (Summers 1993)

The walk-back from Summers' ruthless version of ecological modernization, based on pollution-commodification, was deemed politically necessary at the time. Yet it was unconvincing, for

emissions trading had already begun in earnest after 1990 U.S. Clean Air Act amendments, so as to phase out SO2 and NOx emissions in Los Angeles. Although less efficient than the outright German ban on acid-rain causing substances in the Ruhr Valley, this approach was the basis for Gore's (2006, 252) promotion of carbon markets not only in the 1997 Kyoto Protocol but also in his Nobel Peace Prize award-winning film and book, *An Inconvenient Truth*: "The European Union has adopted this U.S. innovation and is making it work effectively there."

The claim was soon shown to be nonsense, for the EU Emissions Trading Scheme went through extreme price gyrations and then failed entirely, with CO2 emissions prices per ton falling from €32 to €3 from 2006-13. Only in 2019 did the price return to the €30 range as EU regulators cut back on the permit-granting supply side. But the extremely speculative character of what critics (e.g. Bond 2012) term "privatized air" was obvious in 2020, what with the April financial market collapse, pulling EU ETS permits back to €16/ton. Soon the sloshing of trillions of dollars worth of central banks' Quantitative Easing monies into financiers' pockets in turn revived financial speculation, including the price of EU ETS permits to a record €55/ton just over a year later. In addressing the world's greatest crisis, the market strategy was obviously a recipe for yet more volatility, which is just the opposite of what is required for long-term green-transitional infrastructure investment (Figure 1).

Figure 1. Price of European Union carbon credits, €/ton, 2008-21

Already in 2004, the Durban Group for Climate Justice – a network drawing upon leading international activists' early experiences fighting carbon markets – drew up critiques, suggesting the infeasibility of radicalizing this component of ecological modernization's approach to climate management. These critiques have stood the test of time:

- inventing the property right to pollute through commodifying greenhouse gas emissions is effectively "privatizing air," a moral dilemma given unprecedented global and local levels of inequality;
- GHGs have a non-linear impact, and are simply not reducible to commodity exchange (a ton of CO2-equivalent produced at site X in a particular emissions process is not the same as a ton reduced at place Y);
- the corporations and banks that are most guilty of pollution, and the World Bank (the single institution historically most responsible for fossil fuel financing), are the market's driving forces;
- many of the offsets and carbon trades – e.g. monocultural timber plantations, forest "protection", landfill methane-electricity and bio-engineering gimmickry – devastate local communities and ecologies;
- the price of carbon in all the markets to date is not only inadequate (falling generally below $20/ton) but is also haywire, not least due to systemic corruption, fraud and theft – with no prospect of effective regulation;
- there remains a dangerous potential for markets to become multi-trillion dollar speculative bubbles, similar to other exotic financial instruments;
- the strategy encourages small incremental shifts, distracting us from big changes needed across economy, energy, transport, agriculture, production processes, financing, consumption and disposal;
- the theory that there must be "market solutions" when there is "market failure" and that these can be arranged by bankers, is an inappropriate ideology after ongoing market *system* failures including financial meltdowns that regularly wipe out trillions of dollars of paper wealth (Bond 2012)

The point, here, is that when international climate activists now contest claims of net carbon neutrality (especially those associated with carbon trading or offsetting strategies) – such as Google and Apple announced in September 2020 – it is vital to follow the money back to source. This was the appropriate reaction of *Gizmondo* journalist Darna Noor (2020):

- "Google's lifetime net carbon footprint is now zero," Sundar Pichai, CEO of Google and its parent company, Alphabet, said in a blog post. "We're pleased to be the first major company to get this done, today." Pichai said the firm is now moving onto a new goal: running the entire business on carbon-free energy sources, including offices, campuses, and data centers. This all sounds great! Or at least, it would if it weren't a giant vat of bullshit… its offsets have mostly been focused on capturing methane gas where it leaks out of pig farms and landfill sites. Having less methane in the atmosphere is good, but we should get there by moving away from animal agriculture and reducing waste to eliminate the methane emissions at the source.

In sum, any attempt at radicalizing market and offset strategies is not worth contemplating, because this is exactly what Greta Thunberg (2020) dismissively referred to in late 2020: "we waste our time creating new loopholes with empty words and creative accounting."

Nevertheless, contestations of carbon accounting and pricing remain vital, not only to end the market and offset fakery, but also to advance technical alternaties. One illustration is the Biden

Administration's "Social Cost of GreenHouse Gas" (SC-GHG) emissions accounting, revived in 2021 after the Trump regime canceled it. If the U.S. economy is responsible for CO2 emissions of 6.5 billion metric tons each year (about 13 percent of the world total), a full cost accounting should attempt to measure the resulting damage, to immediately reduce it and to suggest the scale of reparations required. However, first-cut 2021 SC-GHG estimates from Biden's Council of Economic Advisors assume that the cost of carbon is just $51/ton, using a 3 percent present discount value. In the same vein, Nobel Economics Prize winner William Nordhaus (2018) had introduced a model for an economically "optimal" level of warming reaching 3.5°C above pre-industrial levels, representing what leading British economist Nicholas Stern (2013) had already warned meant "grafting gross underestimation of risk onto already narrow science models."

The attempt to radicalize ecological modernization that in 2021 was underway on this battleground was mainly over the appropriateness of the discount value and associated calculations. Friends of the Earth U.S. (2021) argued, "The social cost of greenhouse gases is one of the most important numbers that no one has ever heard of. If the U.S. were to assume its fair share of the global effort to limit global temperature rise to 1.5 degrees Celsius, the cost of one ton of GHG emissions would be so high that government support for climate-polluting investments would be a non-starter." The group's alternative analysis put the SC-CO2 at $765/ton, conservatively estimated.

As Friends of the Earth would agree, the point in calculating social and environmental factors – even using framing within natural capital and economic damage accounting – is definitely *not* to price greenhouse gas emissions so as to create a new ethereal nature-commodity and in turn, an environmental market for trading or offsetting. Again, this not need be the case, especially if a Climate Justice movement continues to insist that privatization of the air – emissions markets – have no role in sound climate policy, in the U.S. or anywhere. Indeed as explored elsewhere in the case of South African struggles (Bond 2018a, 2018b and 2021), we might radicalize ecological modernization by *counting* the environmental damage in monetary terms, but to reiterate, the point would not be to promote pollution marketing and offsetting, but instead *only* for the sake of two well-regarded environmental-justice strategies:

- assessing the "ecological debt" that those who have had "unequal ecological exchange" benefits from exploiting nature (usually in the Global North), owe to the victims (usually in the Global South) whose wealth has been depleted without adequate compensation; and
- building up the "anti-extractivism" case to leave minerals underground, partly via the case that rights of future generations to current natural wealth must be respected.

There are numerous cases (Bond and Basu 2021) that illustrate how both ecological debt advocacy and anti-extractivism politics evolve in concrete struggles. If constructed properly, these arguments help establish much more sound foundations for an eco-socialism that is democratic, managed sensibly, and temporally-expansive so as to account for future generations' interests.

To illustrate, Salleh (2021) notes how activists first made environmental reparations demands during the 1990s, including Jubilee 2000 and Quito-based Acción Ecológia. This was useful, she suggests, because "The debt concept forces free riders of the global North to think twice about how international market economies really work, and I would be very happy if the UN or World Bank reversed South to North monetary lows." However, she acknowledges both "the

methodological problem of commensurability – i.e. dollars for what exactly," and that given prevailing power relations, "recipients of reparation would most likely be the ruling class clones of the North who manage nation-states in the global South, so it is doubtful that impoverished communities would benefit from the payments." They are both entirely valid concerns, but not fatal to the argument. First, estimations of (priceless) nature's valuation are only just that, but so too are most insurance-related valuations where there is no formal market. Second, in Namibia in 2008-10, a case of direct, grassroots-oriented Basic Income Grant payments by German Lutherans – aware of their government's 1904-08 colonial genocide there – constituted a successful pilot case for financing on the basis of geographical residence, one that avoided elite interference, anticipating Berlin's formal 2021 confession and $1.3 billion payment commitment (albeit which will go through the state) (Bond 2012).

5. Radicalizing a climate techno-fix?

Harvey's (2020a) approach by no means endorses nature's pricing-for-the-market or the most glaringly false solutions, because to "radicalize the theses of ecological modernization" would mean *dispensing* with the pretense that there are market solutions to such vast market-caused problems. After all, climate catastrophe is, not just, as Stern (2007) put it, "the greatest market failure the world has seen": it is a *market system failure*. But what about technological fixes?

While agreeing that self-imposed market strategies or corporate social responsibility strategies that internalize externalities are highly implausible, The *Hill's* Ryan Grim (2021) recently beseeched the Left to "stop resisting carbon tech" and instead promote "a World War II-level public mobilization" for sequestration (although his version includes Carbon Capture and Storage). He cited Christian Parenti's (2020, 132) "Left Defense of Carbon Dioxide Removal," which in turn criticizes the "deep, often unexamined, technophobia and nature fetish of many environmentalists." Given that a genuine climate fix will require "large-scale technological intervention into the climate system, most greens reject it without further consideration. This is highly dangerous and wrongheaded."

Turning to technological choices, what then, is Harvey's (2020a, 61) preferred approach? In addition to reforestation and protecting threatened jungles (the Amazon, Borneo, central Africa and similar sites), he argues,

- Another option – and I am not an expert on this, and I've only come across this recently so some of you may want to go out there and check this out – is there are forms of cultivation which take the carbon dioxide and put it back underground. Now, you can put it underground six inches but if you deep plow then you release it again. There's going to have to be a radical change in agricultural technology and agricultural techniques. But there are also crops which put the carbon dioxide six feet underground…

This preferred ecological modernization strategy is bio-technological. Its radicalization would require a major shift in socio-economic management of the planet's surface area, according to Harvey, far transcending any intrinsic market incentives (2020a, 61):

- There is one sign of hope here. In the European Union and also in the United States, there are programs which pay farmers not to grow anything because there is an agricultural surplus. This means taking some land out of production. Well, instead of paying farmers to grow nothing, why wouldn't we pay them to grow the kinds of crops which actually put the carbon dioxide back in the ground?

Aside from the question of whether this may become merely a Payment for Ecosystem Services offset gimmick, to be avoided for reasons discussed above, is such a biotech strategy plausible? In San Diego, *Bloomberg* (2020) reports, "Carbon-sucking bionic weeds are new front in climate change war", thanks to gene editing using Crispr technology. There, Joanne Chory's "Carbon Removal on a Planetary Scale" (CROPS) project received $35 million from TED Talks, the Bill & Melinda Gates Foundation and MacArthur, to nurture

- *Arabidopsis thaliana*, a small flowering piece of greenery that often blooms by the roadside… By genetically engineering these weeds to grow unusually deep with hefty root structures, rich in an impermeable corklike polymer called suberin, Chory and her team at the Salk Institute for Biological Studies attempting to vastly increase the amount of carbon dioxide each of these plants sucks out of the air and buries underground. If they can replicate these qualities in wheat, corn, soy, rice, cotton, and canola – which together occupy more than half of Earth's arable land – Chory and her colleagues believe they might just save the world.

For For Chory, the main problem was managerial: "The infrastructure is already all there. All we have to do is convince farmers to plant our seeds" (*Bloomberg* 2020). If successful, as the *Washington Post* continued in a mid-2021 report, Choudry and her team would conduct

- large field trials, scaling up production, and persuading business and politicians to get on board. By 2030, they hoped, ideal crops would occupy half a million acres. By 2035, the plants would sequester 4 to 8 gigatons of carbon dioxide each year — between 10 and 20 percent of humanity's current annual emissions. But then the coronavirus pandemic consumed the country and shuttered their lab. Two generations of experimental plants were lost. (Kaplan 2021)

The audacity of a global planting strategy to sequester sufficient CO2 to reduce greenhouse-gas ppms to a safe level is stunning. But among all the critics of technofix bioengineering I could reach to enquire about this strategy in 2019-20, such as the ETC Group and a half-dozen leading scholar-activists in the field, it was only University of Vermont soil scientist Fred Magdoff (2020) who answered my question as to the viability and ethics of this approach. He acknowledges that suberin decomposes more slowly than carbohydrates and rootsincrease soil organic matter and hence retain carbon better than above-ground residues. But suberin "*is* decomposed by a number of fungi and even some bacteria" which will increase the more suberin is present in the soil. Moreover, the suberin will, simply said, take up too much space:

- as a general rule, *stable organic matter in soil is not stable because of its chemical composition*. Rather it is stable when in locations that are difficult for organisms to access: held inside soil aggregates (sequestered from organisms) or as small molecules that are strongly attached (adsorbed) to clay particles. Once these "sites" are fully occupied, residues are a lot more susceptible to microbial decomposition, regardless of their composition.

Magdoff also warns of

- a trade off, if more photosynthate is transported below ground to produce more roots, it could be at the expense of above ground growth (yield of crops). And photosynthate is not just needed by roots to put on biomass. They exude a large quantity of a variety of biochemicals into the immediately surrounding zone (the rhizosphere) which serves as

nutrition for soil organisms. Thus, a greater root mass implies even more photosynthate going below ground than just needed to build more root tissue.

Magdoff instead recommends agroecology: "good crop rotations, use of cover crops, mulches, and attention to building up soil organic matter. And for the longer run, I would point to the efforts of the Land Institute in Kansas to perennialize grain crops," e.g. the intermediate wheatgrass Kernza. Because wheat, corn and sorghum typically have "both extensive root systems and decreased soil disturbance, they promote soil organic matter increases" so to sequester more CO2 (Magdoff 2020).

Agroecological strategies have long been suggested and benefits quantified, e.g. by Rattan Lal (2004, 1): "conversion of marginal lands into restorative land uses, adoption of conservation tillage with cover crops and crop residue mulch, nutrient cycling including the use of compost and manure… may offset one-fourth to one-third of the annual increase in atmospheric CO2." Klaus Lorenz and Lal (2018, 162) argue for more research on deep mineral cropland soils for this purpose, especially "Soil Organic Carbon-accreting crops (e.g., crop plants with a bushy and deep root system, C4 crops, perennial crops) to recarbonize cropland soils is among the top researchable priorities." This need not necessarily entail high technology, for Miguel Altieri and Clara Nicholls (2017, 23) also show how alongside soil management and water harvesting, "resiliency to climate disasters is closely linked to the high level of on-farm biodiversity, a typical feature of traditional farming systems."

The struggle for eco-socialism must necessarily confront these sorts of urgent strategic conundrums: when and where to use technology, as well as how to identify appropriately radical (and non-market) pricing mechanisms. I find myself comparing and contrasting these approaches when contemplating how and when to "radicalize ecological modernization" (as does Magdoff above), or in contrast, to unite with those in the environmental justice movement who tend to reject such strategies. The challenge usually requires generating stronger, more wide-ranging analysis. For Salleh (2021), the "ecological-modernist expectations of progress do not hold up" when she hears claims that "new technological efficiencies can de-materialise the amount of resources used by industry." Her own radicalization of the discourse includes a demand for "fully researched" implications to be considered, i.e., "all the relevant operational aspects of mining, smelting, manufacture, communications, transport, and waste disposal," with all forms of knowledge drawn into debates about appropriate technology.

To assist, Andrew Jamison (2001) has offered this set of dichotomies between the ecological modernization viewpoint (his term is the "green business" mentality) and environmental justice (which he calls "critical ecologies"). The conflict does appear dialectical, and does lead to a third option that can be reframed as eco-socialism (a semantic liberty I have taken with Jamison's rubric) (Table 1).

Dialectics of environmentalisms

terrain	ecological modernization	environmental justice	eco-socialism
type of agency	corporations, states, global agencies	environmentalists, radical communities, green NGOs	hybrid red-green networks

terrain	ecological modernization	environmental justice	eco-socialism
forms of action	commercial, brokerage	popularization, resistance	exemplary mobilization
ideal of "science"	theoretical, expert	factual, lay	situated, contextual
knowledge sources	Disciplines	traditions	Experiences
Competencies	Professional	personal	Synthetic

Source: adapted from Jamison, Andrew. 2001. *The Making of Green Knowledge: Environmental Politics and Cultural Transformation*. Cambridge, Cambridge University Press.

6. Conclusion: Dialectical potentials

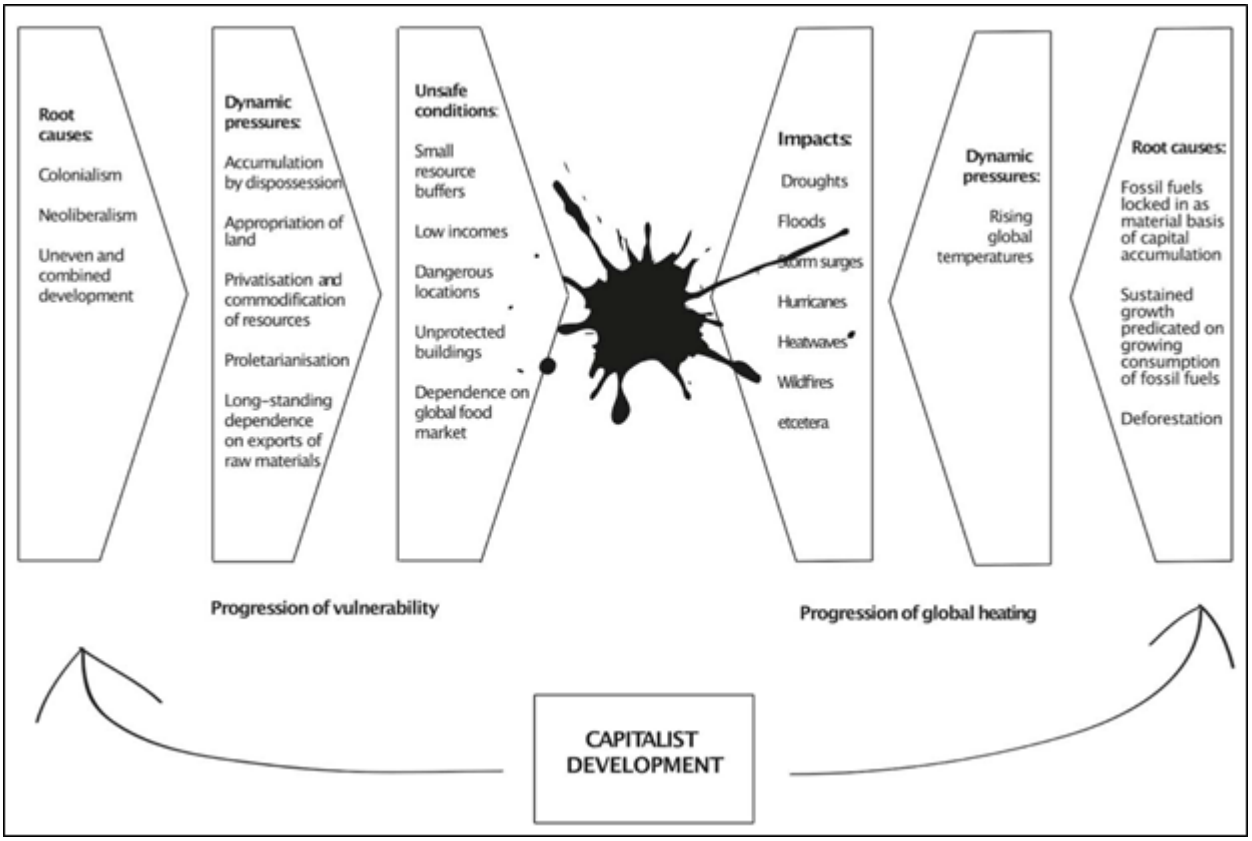
Recall a long-stated injunction by Richard Levins and Richard Lewontin (1985, 191): "Dialectical materialism is not, and has never been, a programmatic method for solving particular physical problems. Rather, dialectical analysis provides an overview and a set of warning signs against particular forms of dogmatism and narrowness of thought." Nevertheless, are there practical applications of these controversial ideas? To answer, we turn for immediate conceptual and strategic orientations first to evolutionary epidemiologist Rob Wallace (2021). In a recent essay (prior to the renewed controversy over whether Covid-19 might have emanated from a lab leak in Wuhan instead of being a zoonotic disease), he not only condemns Covid-19 mismanagement, but offers programmatic strategies for the rational, coherent reordering of society-nature relations at different scales, including:

- **Reintroduce agriculture and nature**. To keep Covid-21, -22, and -23 from emerging next, whether as another SARS or as an avian influenza, Ebola, African swine fever, or any of the hundreds of potential protopandemics, we must end global agribusiness, logging, and mining as we know them. We need to reintroduce the mosaic food landscapes of complex ecologies and agrobiodiversities that disrupt the evolution of the deadliest of pathogens.
- **Return rural sovereignty**. Such interventions require returning rural communities their locus of control. We must turn to the kind of state planning that centers farmer autonomy, community socioeconomic resilience, circular economies, integrated cooperative supply networks, food justice, land trusts, and reparations. We must undo deeply historical race, class, and gender trauma at the center of land grabbing and environmental alienation.
- **Imagine humanity beyond the market**. Such a political reordering requires that we end the unequal ecological exchange between the Global North and South. It requires that we plant a different political philosophy in the landscape, making a better balance of humanity's appropriation of Earth's resources and healing the metabolic rift between ecology and economy. (Wallace 2021, 11-12)

Wallace's strategies highlight deeper causalities than are ordinarily acknowledged much less openly discussed in the mainstream of public policy and environmental politics. Yet they are

vital to a coherent strategy during the multiple crises humanity faces. To illustrate, Ben Wisner's dialectic of socially-constructed hazards and natural disasters allows Malm (2020, 69) to observe a "progression of vulnerability" from "root causes" to "dynamic pressures" to "unsafe conditions" (Wisner et al 2005), "and then comes the deluge. The hazard is but a trigger that releases the social pressures long accumulated: geophysicalism turned on its head... Disaster planning must be, broadly speaking, socialist, so as to heal the wounds before people go to meet the forces of nature" (Figure 1).

Figure 1: A dialectal model of climate disaster



Source: Malm 2020, 70

The vibrant field of eco-feminist socialism adds the critically necessary role of social reproduction to this field, e.g., in Salleh's (2017, 14) *Eco-feminism as Politics*:

- Just as humans are "nature in embodied form", so reproductive labour is the capacity for meeting needs while "holding" together material/energetic exchanges in ecological systems. A bioenergetic theory of value makes more sense than the vanities of man-to-man exchange and, for this, Marx's dialectic can come into play, read as a holographic model of internal relations in a multidimensional field.

Specifically *African* eco-feminist-socialist agency is revealing, here, in sites rife with socio-economic and political-ecological exploitation of the most intense character found anywhere on earth in a non-war setting. Two leading feminist eco-socialists, Leigh Brownhill and Terisa Turner (2019, 1), have long worked to document how "African women have been at the forefront

of resistance to corporate globalization since neoliberalism struck in the 1980s." One result is that, "Being more fully and directly reliant on nature for their daily subsistence, specific African women have faced and resisted enclosure of their commons and collectively maintained indigenous knowledge, seeds, practices, food production, and energy technologies that offer clear alternatives to oil and petro-chemical reliant food and energy systems." Defense of their commons entails, Brownhill and Turner (2019, 10) argue, "a praxis of revolutionary eco-feminism which is at the heart of eco-socialism."

From specific sites of resistance to a broader eco-socialist dialectic, one central network where the fusion of these visions is increasingly explicit is African Women Unite Against Destructive Resource Extraction (WoMin). Parallel to Acción Ecológia's long-standing efforts across Latin America, Johannesburg-based WoMin links many of the continent's leading struggles against extractivism waged by community-based women's groups. At grassroots level, these struggles inexorably address the massive contradictions in society/nature, male/female and – to invoke Rosa Luxemburg's (1913) and Samir Amin's (2018) considerations of Africa's subordinate role within imperialism (Bond 2019, 2021b) – capital/non-capitalist power relations. Assessing the ideological glue in diverse settings, WoMin founder Samantha Hargreaves (2020) suggests the importance of interlocking approaches to resistance: the commons, *Ubuntu* and progressive Pan-Africanism, including the integrity of "large swathes of the continent held under common or communal property systems" which at their finest – where matriarchy and inter-generational stewardship successfully contest patriarchy – entail decommodifying principles.

Second, the tradition of what might be termed pre-capitalist land management within hybrid forms of both ownership relations and social reproduction – with migrant labor increasingly common – occurs in the context of a much less alienated form of human relations, that often adopts the mutual-aid rubric of Ubuntu: *"I am because we are."* For WoMin, the feminist Ubuntu "values care, love, empathy, respect, and common interest over individualism, which few in progressive social movements would argue does not represent, in part, the type of society, community, Africa and world we strive for" (Hargreaves, 2020).

These represent the environmental justice tradition discussed above. The tension with ecological modernization comes alongside WoMin members' critiques of the localized capitalocene: (gendered) small-scale agricultural production systems on the land threatened by land grabs and air-water-land pollution; women's burdens during climate breakdowns due to fossil-fuel extractivism; and the *de facto* responsibility that women are given to steward life itself (including ecological inheritances) into future generations. According to WoMin's (2019, 9) framing, cost accounting and demands for ecological debt logically follow when "campaigning to force the internalization of real costs, which would render the majority of projects unsustainable":

- WoMin will deepen its efforts to foreground a feminist analysis of costs, showing that this places particular burdens on the cheap and unpaid labor of impacted women. We will grapple further with the problematic of costing damage and impacts, immediately and on a cumulative basis, to show that an extractivist model of development does not advance people and their economies, but rather destroys and immiserates them. We will show the inter-generational costs of extractivism and we will work to argue that Africa and African nations are losing sovereign wealth through extractivism and only becoming poorer.

Assume that with such calculation – even carried out by ecological modernizers themselves (such as was promised by the 2012 Gaborone Declaration organized by Botswana's president,

Conservation International and the World Bank) – it becomes crystal clear that most of Africa's and indeed the world's mining and fossil-fuel projects are *objectively unsustainable* and, for the countries involved, causing net wealth-depletion. In Sub-Saharan Africa's case the net annual costs of mining amount to more than $100 billion annually, even the World Bank admits (Bond 2018c; Lange et al, 2018).

Assume, too, that by invoking analysis that is aware not only of such wealth depletion through extractive industries, but also the widely differential class, race, gender, North-South, ecological and generational inequalities that follow, such "accounting of costs" really can reveal who wins and loses, across time and space. This exercise would, in turn, not only assist in struggles waged against extractivist projects, but also more generally against carbon-intensive maldevelopment. And alongside renewed critique of the uncompensated and often unnecessary extraction of non-renewable minerals, oil and gas, the broader question of climate catastrophe is logically raised. Hence with unequal ecological exchange unveiled, the call for reparations for Africa – to pay for such debilitating injustices of resource extraction and climate loss and damage (running now into additional tens of billions dollars annually) – can be advanced.

Finally, the most critical aspect of eco-socialist organizing applied to climate catastrophe, is integrating the next and future generations' interests. For example, South Africa's best-known young climate activist, Ayakha Melithafa (2020), speaks colloquially but nevertheless clearly sets, as her aim, to:

- target the system of capitalism. But we know that capitalism disguises itself. We know that it has been running over and over, and that the rich get richer and the poor get poorer. And that's quite grueling. And I feel like we know that the working class has the power to change that. Because if a worker says no, the employer has to do something because they don't want to lose their workers. But the problem is that our unemployment rate is so high and we know that our workers are disposable. So that's taking quite a time for us to move to a greener, sustainable future – it's because we can't take down the system of capitalism. We realise that the power is in our hands, and that we have the power as civil society, as just people on the ground, the working class. If we can actually stand together and sacrifice what we can, we will be able to change our society and live for a better future. We see youth are standing up all over the world, in Nigeria against SARS [the most repressive arm of the police], and in Liberia and so many African countries. We are saying "No!" as the youth. And it's so important for us to move forward in the correct and direct way.

Engels would agree, given that, as Sheehan (2017, 41) interprets,

- Dialectical movement involved constant regeneration and renewal. Everything carried within itself the conditions of its own annihilation. The old was in the process of dying, while the new was in the process of being born. The new negated the old, replaced the old, while carrying forward certain aspects of it in a new and higher synthesis and in a more vigorous form. Each phase was only a temporary synthesis that contained the seeds of its own supersession and of further development in a new synthesis.

It is just such a temporary synthesis that should allow us to embrace the radicalization of ecological modernization by environmental justice advocates, en route to the next-generation contradictions that will surely emerge, too, within a future eco-socialism.

REFERENCES

- Altieri, Miguel and Clara Nicholls. 2017. "The Adaptation and Mitigation Potential of Traditional Agriculture in a Changing Climate." *Climatic Change*, 140, 23-45. DOI 10.1007/s10584-013-0909-y
- Amin, Samir 2018. *Modern Imperialism, Monopoly Finance Capital, and Marx's Law of Value*. New York, Monthly Review Press.
- Angus, Ian 2015. "Hijacking the Anthropocene." *Climate & Capitalism*, May 19. https://climateandcapitalism.com/2015/05/19/hijacking-the-anthropocene/
- *Bloomberg* 2020. "Carbon-sucking Bionic Weeds are new Front in Climate Change War." *Bloomberg*, September 25. https://www.bloombergquint.com/businessweek/climate-change-biologists-develop-carbon-sucking-bionic-plants
- Bond, Patrick 1998. *Uneven Zimbabwe*. Trenton, Africa World Press.
- _____. 2012. *Politics of Climate Justice*. Pietermaritzburg, University of KwaZulu-Natal Press.
- _____. 2018a. "Social Movements for Climate Justice, from International NGOs to Local Communities." in S.Lele, E.Brondizio, J.Byrne, G.M.Mace and J.Martinez-Alier. eds. *Rethinking Environmentalism: Linking Justice, Sustainability, and Diversity*. Cambridge, Massachusetts Institute of Technology Press.
- _____. 2018b. "Climate Debt, Community Resistance and Conservation Alliances against KwaZulu-Natal Coal Mining at Africa's Oldest Nature Reserve." in Bettina Engels and Kristina Dietz. eds. *Political and Social Impacts of Climate Change in Africa*, Frankfurt, Peter Lang Verlag.
- _____. 2018c. "Ecological-Economic Narratives for Resisting Extractive Industries in Africa." *Research in Political Economy*, 33, 73-110.
- _____. 2019. "Luxemburg's Critique of Capital Accumulation, Applied again in Africa." *Journal für Entwicklungspolitik*, 35:1, 92-118.
- _____. 2021a. "Biden-Kerry International Climate Politricks." *CounterPunch*, February 1, https://www.counterpunch.org/2021/02/01/biden-kerry-international-climate-politricks/
- _____. 2021b. "Luxemburg's Contemporary Resonances in South Africa." in D.Cornell and J.Gordon. eds. *Creolizing Rosa Luxemburg*. New York, Rowman and Littlefield.
- Bond, Patrick and Rahul Basu 2021. "Intergenerational Equity and the Geographical Ebb and Flow of Resources: The Time and Space of Natural Capital Accounting." in M.Himley and E.Havice. eds. *Handbook of Critical Resource Geography*, New York, Palgrave Macmillan
- Bracking, Sarah. 2015. "The Anti-Politics of Climate Finance: The Creation and Performativity of the Green Climate Fund", *Antipode*, 47:2, 281-302.

- Brownhill, Leigh and Terisa Turner. 2019. "Eco-feminism at the Heart of Eco-socialism." *Capitalism Nature Socialism*, 30:1, 1-10. https://www.tandfonline.com/doi/full/10.1080/10455752.2019.1570650
- Costanza, Robert and Herman Daly. 1992. "Natural Capital and Sustainable Development." *Conservation Biology* 6, 37-46.
- Foster, John Bellamy. 2011. "Capitalism and Degrowth: An Impossibility Theorem." *Monthly Review*, January, https://monthlyreview.org/2011/01/01/capitalism-and-degrowth-an-impossibility-theorem/
- _____. 2020. *The Return of Nature: Socialism and Ecology*. New York, Monthly Review.
- Fraser, Nancy. 2021. "Climates of Capital: For a Trans-environmental Eco-socialism." *New Left Review*, January-February.
- Frietas, Samira Garcia and Christopher Jones. 2020. "A Review of the Role of Fossil Fuel Based Carbon Capture and Storage in the Energy System." Tyndall Manchester Climate Change Research, Manchester. https://foe.scot/resource/report-carbon-capture-storage-energy-role/
- Friends of the Earth U.S. 2021. "New Analysis Reveals that the Cost of CO2 is at least 15 Times the Amount that Biden Currently Supports." Washington, 22 June. https://foe.org/news/new-analysis-reveals-that-the-cost-of-co2-is-at-least-15-times-the-amount-that-biden-currently-supports/
- Gates, Bill. 2021. *How to Avoid a Climate Disaster*. New York, Alfred A. Knopf.
- Gore, Al. 2006. *An Inconvenient Truth*. New York, Rodale.
- Grim, Ryan. 2021. "The Left needs to Stop Resisting Carbon Tech." *The Hill Rising*, June 30. https://www.youtube.com/watch?v=agK53OJ-kIk
- Hargreaves, Samantha. 2020. "Crises, Dreaming, and (Re)Building on African Terms." Women in Mining position paper for the South African Climate Justice Charter, unpublished paper, Johannesburg.
- Hartwick, John. 1977. "Intergenerational Equity and the Investing of Rents from Exhaustible Resources." *American Economic Review*, 67(5), 972-74.
- Harvey, David. 1993. "The Nature of Environment: The Dialectics of Social and Environmental Change." in *The Socialist Register 1993*. New York, Monthly Review Press.
- _____. 1996. *Justice, Nature and the Geography of Difference*. Oxford, Basil Blackwell.
- _____. 2020a. *The Anti-Capitalist Chronicles*. London, Pluto Press.
- _____. 2020b. "Why Marx's *Grundrisse* is Relevant Today." @Democracy at Work, October 22. https://www.democracyatwork.info/acc_why_grundrisse_relevant_today
- Intergovernmental Panel on Climate Change. 2018. *Global Warming of 1.5°C*. New York, United Nations. https://www.ipcc.ch/sr15/
- Jamison, Andrew. 2001. *The Making of Green Knowledge: Environmental Politics and Cultural Transformation*. Cambridge, Cambridge University Press.

- Jänicke, Martin 1984. Umweltpolitische Prävention als ökologische Modernisierung und Strukturpolitik, Wissenschaftszentrum Berlin (IIUG discussion papers 84-1).
- Kaplan, Sarah. 2021. "Joanne Chory is using Plants to Save the Planet." *Washington Post*, 28 April. https://www.washingtonpost.com/climate-solutions/interactive/2021/joanne-chory-climate-plants/
- Laibman, David. 2020. "Incentives, Optimization, and Democratic Planning: A Socialist Primer." *Science & Society*, 84:4, https://doi.org/10.1521/siso.2020.84.4.510
- Lal, Rattan. 2004. "Soil Carbon Sequestration to Mitigate Climate Change." *Geoderma*, 123:1-2, 1-22. https://doi.org/10.1016/j.geoderma.2004.01.032
- Lange, Glenn-Marie, Wodon, Quentin and Kevin Carey. eds. 2018. *The Changing Wealth of Nations 2018*. Washington, DC, The World Bank.
- Levins, Richard and Richard Lewontin. 1985. *The Dialectical Biologist*. Cambridge, Massachusetts, Harvard University Press.Lorenz, Klaus and Rattan Lal. 2018. *Carbon Sequestration in Agricultural Ecosystems*. London, Springer.
- Luxemburg, Rosa. 1913. *The Accumulation of Capital*. Berlin.
- Magdoff, Fred. 2020. Personal correspondence, available from the author, pbond at mail.ngo.za
- Malm, Andreas. 2018. *The Progress of this Storm*. London, Verso.
- _____. 2020. *Corona, Climate, Chronic Emergency*. London, Verso.
- Melithafa, Ayakha. 2020. Sharpening the Spear of Climate Justice. European Film Festival Panel Input, Cape Town, December 4. https://youtu.be/f1aILK0EDzk?t=2864
- Milman, Oliver. 2015. "James Hansen, Father of Climate Change Awareness, calls Paris Talks "A Fraud'." *The Guardian*, December 12. https://www.theguardian.com/environment/2015/dec/12/james-hansen-climate-change-paris-talks-fraud
- Monbiot, George. 2021. "Why is the Science Museum still being Contaminated by Shell's Dirty Money?" *The Guardian*, April 21. https://www.theguardian.com/commentisfree/2021/apr/21/science-museum-shell-money-exhibition-climate
- Noor, Dharna. 2020. "Google's Carbon Offset Plan Shows Where the World Has Failed on Climate Change." *Gizmondo*, September 14. https://earther.gizmodo.com/google-s-carbon-offset-plan-shows-where-the-world-has-f-1845052789
- Nordhaus, William. 2018. "Projections and Uncertainties about Climate Change in an Era of Minimal Climate Policies." *American Economic Journal: Economic Policy* 10:3, 333–360.
- Parenti, Christian. 2020. "A Left Defense of Carbon Dioxide Removal," in Sapinsky, J.P. Holly Jean Buck and Andreas Malm (Eds). 2020. *Has it Come to This?* New Brunswick: Rutgers University Press.
- Salleh, Ariel. 2017. *Eco-feminism as Politics*. London, Zed Books.

- _____. 2021. “A Regenerative Ethic for a Gender Just Transition.” Interview, University of New South Wales Institute for Global Development. https://www.igd.unsw.edu.au/conversation-just-transition-ariel-salleh
- Sapinsky, J.P. Holly Jean Buck and Andreas Malm (Eds). 2020. *Has it Come to This?* New Brunswick: Rutgers University Press.
- Schmidheiny, Stefan. 1992. Changing Course. Cambridge, MIT Press.Schwartzman, David. 2020. “An Ecosocialist case for CO2 removal technology.” *Climate & Capitalism*, March 7, https://climateandcapitalism.com/2020/03/07/ecosocialist-case-for-co2-removal/.
- Schwartzman, Peter and David Schwartzman. 2019. *The Earth is Not for Sale: A Path Out of Fossil Capitalism to the Other World That is Still Possible*. Singapore: World Scientific.
- Sheehan, Helena. 2017. *Marxism and the Philosophy of Science: A Critical History*. London, Verso.
- Shiva, Vandana. 2021. “Bill Gates and his Fake Solutions to Climate Change.” Florence, Navdanya International, April 21. https://navdanyainternational.org/bill-gates-his-fake-solutions-to-climate-change/
- Solow, Robert. 1974. “The Economics of Resources or the Resources of Economics.” *The American Economic Review*, 64(2), 1-14, http://links.jstor.org/sici?sici=0002-8282%28197405%2964%3A2%3C1%3ATEOROT%3E2.0.CO%3B2-4
- Stern, Nicholas. 2007. *The Economics of Climate Change*. Cambridge, Cambridge University Press.
- _____. 2013. “The Structure of Economic Modeling of the Potential Impacts of Climate Change.” *Journal of Economic Literature*, 51:3, 838–859.
- Summers, Lawrence. 1991. “The Memo.” Washington, DC, The World Bank, December 12, http://www.whirledbank.org/ourwords/summers.html Summers, Lawrence. 1993. “Nomination of Lawrence H. Summers to be Undersecretary of the Treasury for International Affairs.” United States Senate Committee on Finance, Washington, DC, March 18. https://www.finance.senate.gov/imo/media/doc/hrg103-41.pdf
- Surprise, Kevin. 2020. “Stratospheric Imperialism: Liberalism, (Eco)modernization, and Ideologies of Solar Geoengineering Research.” *Nature and Space*, 3:1, 141–163. https://journals.sagepub.com/doi/full/10.1177/2514848619844771
- Swyngedouw, Erik. 2010. “Apocalypse Forever?” *Theory, Culture & Society*, 27(2-3), 213–232. doi:10.1177/0263276409358728
- TEEB. 2020. “The Economics of Ecosystems and Biodiversity.” 2020. http://www.teebweb.org/
- Thunberg, Greta. 2020, “We are Speeding in the Wrong Direction on Climate Crisis.” *The Guardian*, December 10. https://www.theguardian.com/environment/2020/dec/10/greta-thunberg-we-are-speeding-in-the-wrong-direction-on-climate-crisis

- United Nations World Commission on Environment and Development Sustainability. 1987. *Our Common Future*. Oxford, Oxford University Press.
- Wallace, Rob. 2021. "Bidenfreude: Covid-19 in the Post-Trump U.S." New York: Rosa Luxemburg Foundation. https://rosalux.nyc/wp-content/uploads/2021/01/Biden2021-On-the-Precipice-.pdf
- Wisner, Ben, Piers Blaikie, Terry Cannon and Ian Davis. 2005. *At Risk*. London: Routledge.
- WoMin. 2019. "WoMin Five Year Strategy (2020-2024)." Unpublished. Johannesburg.
- World Bank. 2012. *Inclusive Green Growth*. Washington, DC, The World Bank.
- World Economic Forum. 2020. "The Great Reset." Davos, Switzerland. https://www.weforum.org/great-reset/

Footnotes

[1] By way of disclosure, my doctoral studies (published in Bond 1998) were with Harvey (from 1985-93); this was just prior to his publication of major texts on eco-socialist and other environmental narratives (Harvey 1993, 1996).

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