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A Science-Based Ecosocialist Strategy for Climate Security

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Abstract

The natural, physical, and informational sciences—in particular, climatology, ecology, biogeochemistry, and thermodynamics—which along with the wisdom derived from the experience of thousands of years of indigenous peoples' agriculture and culture should inform an effective global plan to prevent future climate catastrophes much worse than now witnessed which will very likely occur if the 1.5°C warming limit is exceeded in the next few decades. Strategy is imperative to guide transnational political struggle, to first defeat fossil capital while creating a Global Green New Deal (GGND) confronting the growing threat of climate catastrophes. Degrowth has been promoted as a program for climate security, but a major problem is its grounding in Georgescu-Roegen's fallacious entropy concept with regard to energy supplies to society. Degrowthers call for a global reduction in energy. However, sufficient levels of renewable energy likely greater than the present global energy consumption level will eliminate energy poverty while having the capacity for climate mitigation and adaptation with a phase out of extractive industries. Organizing for a GGND must start now with the recognition of the role of green capital at least in its first stage, both for implementation of an ever-growing renewable energy infrastructure replacing fossil fuel, as well as a potential ally in defeating the agenda of militarized fossil capital. At the same time, green capital must be challenged to insure environmental, worker and community protection. The GGND can potentially develop in an increasingly ecosocialist direction, culminating with end of reproduction of capital on the planet.

Keywords: Strategy, Green New Deal, Ecosocialism, Renewable Energy, Prefiguration, Class Struggle, Solar Communism

This paper is claiming it is proposing a science-based strategy. So, what is this science I point to? The science I speak of is not so-called "Western" science, rather global. Take note that James Poskett (2022) provides comprehensive evidence that modern science is global not "Western" both from its development and current participation. This science must inform ecosocialist theory and practice.

Science, thermodynamics, and climate science in particular should inform an ecosocialist strategy to confront the growing threat of climate catastrophes. The lack of strategic thinking in the socialist left confronting the challenge of preventing climate catastrophe as tipping points are being rapidly approached is a non-recognition of and missed opportunity to confront this historic opportunity to end the rule of capital on our planet. In this regard, take note of what I wrote:

> Socialist or Marxist political economy is necessary but not sufficient in itself to advance a vision of 21st Century socialism. This vision must fully engage the natural, physical and informational sciences—in particular, climatology, ecology, biogeochemistry, and thermodynamics—as well as take full account of the wisdom derived from the experience of thousands of years of indigenous peoples' agriculture and culture. This will inform the technologies of renewable energy, green production, and agroecologies, whose infrastructure are to replace the present unsustainable forms. (Schwartzman and Schwartzman 2019: 240).

Thus, I will first address the relevancy of climate science and thermodynamics as it informs my critique of degrowth and why a global Green New Deal (GGND) has the potential of implementing a climate protection program, developing in an increasingly ecosocialist direction, culminating with the end of reproduction of capital on the planet. This will be followed by an outline on how advancing from one stage to another the GGND can achieve this goal, as Paulo Freire ([1992] 2014: 1115) put it, "what can we do now in order to be able to do tomorrow what we are unable to do today?"

Recognizing the formidable obstacles ahead that can block the unfolding of an ecosocialist GGND, the necessary conditions to overcome them must be anticipated. But first I will confront the impacts of the ongoing Russian war on Ukraine as well as the Israeli war of genocide on the people of Gaza, followed by a discussion on how climate science and thermodynamics should inform strategy including a critique of the degrowth program.

Strategy in Light of the Russian War on Ukraine and Israel's War on Gaza

The Russian invasion of Ukraine starting on February 24, 2022, has forced a rethinking of strategy for a path to a post-capitalist world. On one hand it should have reinforced recognition of the reality of the main obstacle, the power of militarized fossil capital and its political instruments whether it be in the U.S./NATO axis or its antagonist, Putin's Russia. On the other hand, it should have undermined the "enemy of our enemy is our friend" camp in the left; but unfortunately, this camp still has its pole of attraction in effective alliance with the far right, just as sections of the left found themselves in bed with the neofascist anti-vaxx climate denial movement (Malm and Zetkin

Collective 2021). Since left wing policy and ideology is rooted in solidarity and right wing policy and ideology is rooted in hierarchy, the idea of a progressive "left-right" unity is a mirage.

We see a similar pattern in the outbreak of war in the Middle East with Israeli deployment of massive military might in its war of genocide on the people of Gaza, coupled with an intensified attack on Palestinians in the West Bank. The context for this war of genocide is the long reality of Israeli Apartheid along with the ongoing undemocratic denial of equal civic rights to Palestinians within Israel itself. In 2011, I wrote an article "The Path to Climate Security Passes through Gaza" (Schwartzman 2011a). I had no idea this would become a critical challenge today. Linking struggles will be critical to strengthening the global climate/energy justice movement, such as Boycott Divest and Sanction Israel (BDS), health impacts of air pollution and so on, and the climate challenge.

It is now crystal clear that ongoing wars create huge obstacles to the global cooperation necessary for any chance of meeting the 1.5°C warming target—as evidenced in the *Science* editorial of April 1, 2022, "To Solve Climate, First Achieve Peace" (Thorp 2022), which recognized this obstacle and called for the imperative cooperation of the United States and China to reach the goal of climate security.

While we witness a renewed call for investing in the renewable energy alternative the fossil fuel industry is enjoying a bonanza of investment making the meeting of the 1.5°C warming target ever so much more difficult. Fracking in the United States is being revisited to generate liquefied natural gas (LNG) for export to Europe to substitute for any cutoff of Russian natural gas (Climate Action Tracker 2022; Stancil 2022). In addition, the war on Ukraine has reenergized plans for building more nuclear fission reactors in response to curbing Russian energy imports, for example in the UK (Nelson 2022).

There are promising indications that renewable energy will significantly expand its global capacity in the near future. In 2022, "$1 Trillion Green Investment Matches Fossil Fuels for First Time" (Baker 2023), with most "green" investment in renewable energy and electric vehicles, with solar and wind power accounting for the biggest chunk of 2022 investments, reaching $495 billion (Baker 2023). Further, the International Energy Agency (IEA) projects that Renewables Will Overtake Coal by Early 2025:

> In a new report, the international group [IAE] said that solar, wind and other renewable sources will expand much more swiftly than forecast last year…Worldwide, growth in renewable power capacity is set to double by 2027, adding as much renewable power in the next five years as it did in the past two decades. (Shao 2022)

Nevertheless, despite this welcome news, unless fossil fuel consumption peaks in the very near future and is completely terminated by 2040 the IPCC warming target will be breached (see next section). The projected increase in coal demand in 2024 will pose a big challenge in this regard:

> Coal demand in China is expected to grow by 1% in 2024 to reach 4.9bn tonnes, which is another record, according to the IEA. India is expected to see demand

> grow by more than 5% to 1.3bn tonnes, a level previously reached only by China. (Ambrose 2024)

Climate Science and Thermodynamics Should Inform Strategy

First, I confront what climate science is telling us about the threat of overshoot and the 1.5°C warming target. We now face the increasing threat of reaching dangerous climatic tipping points simultaneously with an incoming climate denialist Trump administration with virtual control of Congress. Given this sober outlook, should we assume, as media pundits tell us, that the 1.5°C warming target is dead, or is there still a window of opportunity to avoid breaching it?

A recent study shows how a warming planet has intensified the El Niño and La Niña climate patterns, becoming more frequent and extreme. This means extreme droughts, floods, and heatwaves as well as threatening food supplies, spreading disease, and impacting societies and ecosystems (Cai, et al. 2023; Hausfather 2023; Readfearn 2023b).

The latest report of the Indicators of Global Climate Change Project concludes,

> Human-induced warming is now increasing by more than 0.2°C per decade. Increased temperatures are driving "an intensification of many weather and climate extremes, particularly more frequent and more intense hot extremes, and heavy precipitation across most regions of the world. Between 2012 and 2021, greenhouse gas emissions were at an all-time high, adding the equivalent 54 billion metric tonnes of carbon dioxide into the atmosphere every year. That's about 1,700 tonnes every second. The Earth's "carbon budget"— the emissions that can be released to have a 50% chance of keeping global temperature rise under 1.5°C—is shrinking fast. (Forster et al. 2024)

In 2020, the IPCC calculated the remaining budget at 500 gigatons of carbon dioxide and other greenhouse gases. It is now about 250 gigatons" (Climate and Capitalism 2023).

Malm and Carton (2024) make a very important contribution to the struggle for climate protection in their book, emphasizing that overshoot breaching the 1.5°C warming target must be avoided as much as possible. There must be a fierce struggle to avoid every 0.01°C, 0.1°C of additional warming over the 1.5°C target, as the climate scientist Richard Betts recognized. Betts concludes that to have any chance of limiting warming to below 1.5°C we have to bring emissions to zero or Net Zero by the middle of the century at the latest (Retallack 2023). Note that the very problematic details of Net Zero, like the invocation of overshoot by allies of fossil capital, are thoroughly analyzed by Malm and Carton's (2024) book. I do not accept the problematic goal of "net zero" rather than real zero. Further, the carbon removal technologies are not the false solution of carbon capture and storage (CCS) coupled to continuing burning fossil fuels as in net zero, but rather direct air capture of carbon dioxide (DAC) and permanent burial in the crust in the form of carbonates. DAC will very likely be imperative along with the restoration of natural ecosystems and the shift to agroecologies, since the latter carbon sinks into the soil are limited by saturation and future temperature increases, even meeting the 1.5°C warming target. Carton and Malm (2024) say "there is the dubious feasibility of planetary-scale carbon removal." However, planetary-scale

carbon removal from the atmosphere will be needed to bring down the atmospheric level of carbon dioxide below 350 ppm and keep it there, but only after there is a global commitment for and implementation of a program for a rapid and complete termination of fossil fuel combustion and only when enough renewable energy capacity is in place to drive this removal. A promising site for this drawdown is in Oman where highly reactive ultramafic rocks are outcropping (Schwartzman and Schwartzman 2024).

How much above this warming target and for how long overshoot persists will determine the likelihood of emergence of dangerous tipping points in the climate system. Since there is uncertainty in predicting just when these tipping points kick in, the precautionary principle strongly supports no overshoot as Malm and Carton argue (see Ben-Yami, et al. 2024).

These climatic tipping points include the collapse of massive ice sheets in Greenland and different parts of Antarctica, thawing permafrost, massive die off of forests in the Amazon, northern boreal forests and mangroves and seagrass meadows, degradation of savannas and drylands, nutrient overloading of lakes, coral reef mass mortality, as well as collapse of deep ocean mixing in the North Atlantic and in the Southern Ocean around Antarctica (Dyke and McKay 2023).

In their assessment of nuclear power in their book *Overshoot*, Malm and Carton (2024: 338) say that nuclear fission energy expansion is "neither the problem nor the solution." Rather, it should be viewed as a problem on multiple grounds, including the issue of its diversion of funding from implementation of faster and more potent per investment onsite wind/solar power (Schwartzman 2019b; Schwartzman and Schwartzman 2019; Jaczko, et al. 2022). "Further, significant expansion of nuclear fission power will add incremental heat to the Earth's surface which could contribute to exceeding the 1.5 deg C warming target" (Schwartzman 2023b). For example, China has plans to build hundreds of nuclear reactors (Ferris 2021). The same impact will result from significant implementation of geothermal energy supplies, future onsite fusion power, burning hydrogen derived from the subsurface reservoir, and solar power from space, all with the potential of triggering tipping points with even small increments of heat.

Malm and Carton (2024) lucidly explain the threat of continuing new investment in fossil fuel infrastructure, freezing in fixed capital for coming decades, a big component of the stranded assets challenge. Nevertheless, a demand for the immediate shutdown of fossil fuel extraction, notably of conventional oil, is not only impossible to realize but ignores the fact that we live in a world that still derives 80 percent of its energy needs from fossil fuels, which will be the main energy supply for society and the energy source to create renewable energy technologies, until its replacement by the latter dominating the global energy infrastructure. And the priority for climate protection is to strongly accelerate this replacement with complete termination of fossil fuel consumption in the next two decades to have any chance of not exceeding the 1.5°C warming target.

In our modelling of a 20 year transition to global 100 percent wind/solar supplies, in this scenario we phase out coal and natural gas in the first in the first 10 years, depending on conventional oil to avoid energy poverty and as an energy source for creating renewables. The

phaseout of conventional oil is slow at first, but then more rapidly declines to zero in the 20 year transition (Schwartzman and Schwartzman 2021).[1]

This scenario is relevant to the issue of developing new oil fields versus continued extraction from existing oil fields. Thus, the minimally necessary continued investment in extraction in the next decade can be consistent with the goal of not exceeding the 1.5°C warming target with overshoot, recognizing that the challenge of stranded assets must be solved with the political destruction of fossil capital, as Malm and Carton (2024) argue. Thus, the state oil/energy sector in Middle East, Venezuela, Mexico is a potential strategic ally in a renewable energy transition in the context of the defeat of fossil capital.

Conventional oil has the lowest greenhouse gas footprint of the fossil fuels (natural gas has the highest, followed by coal). But the extraction of conventional oil must strongly limit the continued leakage of methane, the main component of natural gas, to the atmosphere. "Keep the Oil in the Ground" should include using conventional oil to do away with itself as an energy source to create renewable energy technologies. This is still possible if a robust solar transition starts very soon coupled with rapid termination of fossil fuels with using less than 4 percent of proven reserves, limiting warming to no more than 1.5°C (Schwartzman and Schwartzman 2021). The challenge of Stranded Assets emphasized by Malm and Carton (2024) is a potential opportunity for Green Enclosure (Knuth 2017) or better, "the political destruction of fossil capital" (Malm and Carton 2024: 111).

Thermodynamics and the Degrowth Program

Advocates of Degrowth argue that countries in the global North must stop economic growth, significantly reduce their material consumption for any chance of preventing much worse climate catastrophes than now witnessed (e.g., Hickel 2018, 2020; Anderson 2013). With some common objectives to this ecosocialist agenda, including recognizing the challenge of extractivism, degrowth has been promoted as a program for climate security while promising a "satisfactory" standard of living for people of the global South. Rather than this Eurocentric proposal, every child on our planet has the right to expect the highest achievable life expectancy, now enjoyed by a few countries in the global North.

Schmelzer, Vetter, and Vansintjan (2022) argue that the implementation of degrowth of the global physical economy must occur for a hopeful future. Like others who invoke the imperative of degrowth (Hickel 2018, 2020; Cox 2020; Mastini, Giorgos, and Hickel 2020; Ajl 2021; Löwy et al. 2022; Bordera and Pedregal 2021), their argument centers on the challenges of extractivism;

[1] This citation's reference 41 has removed its estimate of the global proven oil reserves. I conclude the value cited in our paper is incorrect. Likewise, the same is true for natural gas, with the corrected estimate being 27 percent of global proven reserves for Scenario II. In 2023, the world's proven crude oil reserves were around 1.57 trillion barrels, excluding oil sands (Statista 2024). Therefore, the corrected amount of oil consumed in our scenarios is 28 percent of the global proven oil reserves, which would allow significant generation of revenue to oil-producing countries in a wind/solar transition. Our estimate for coal is consistent with the original citation.

in particular, the limits to and negative impacts of mining ores for metals needed for renewable energy technologies being promoted by green capital. I recognize that these concerns are well-founded but point to potential remedies that could be implemented in a robust renewable energy transition increasingly guided by an ecosocialist agenda (see later discussion; for my in-depth critique of the degrowth discourse see Schwartzman 2012; 2022a, 2023b, forthcoming).

My critique of degrowth has important implications to the agenda and strategy of a Global Green New Deal (GGND). In this context, while degrowthers wisely argue for reducing energy consumption, they claim that globally energy use should go down by a significant level over the coming decades. However, such a global decline would condemn people in the global South (especially India) to much worse energy poverty than they now endure and forgo the creation of renewable energy capacity to confront climate mitigation and adaptation (Schwartzman and Schwartzman 2021).

Degrowthers fail to recognize the critical difference between the high efficiency capture of the solar flux generating wind/solar power and the fossil fuel energy supply because of their appropriation of Georgescu-Roegen's fallacious entropy concept in his so-called fourth law of thermodynamics, which conflates open and closed systems with respect to energy and mass transfers; the Earth's surface is not closed but rather open to energy going in and out Georgescu-Roegen's fourth law was rejected over thirty years ago even by leading ecological economics scholars who recognized that incoming solar radiation could be the energy supply of global civilization (e.g., Ayres 1998). The Earth's surface is open to energy transfer to and from space but is effectively closed to mass transfer. The use of fossil fuels and nuclear fission power to drive the economy can be transcended in our open Earth system by sufficient creation of a high-efficiency collection of the solar flux to Earth. Global solar power will then pay its "entropic debt" to space as non-incremental waste heat, without driving us to tipping points towards catastrophic climate change, while facilitating recycling and industrial ecologies and phasing out extractivism. Hence, I am disappointed by Schmelzer and co-authors' (2022) invocation of Georgescu-Roegen's entropy law. I suggest that readers see my extended explanation of the relevance of the science of thermodynamic to this critique of Georgescu-Roegen's fourth law in Schwartzman (1996, 2008) and Schwartzman and Schwartzman (2019).

The GDP has been effectively critiqued by degrowthers as a measure of a sustainable economy while recognizing the great negative impacts of high GDP economies dominated by fossil capital. But GDP by itself is not necessarily an indicator of unwelcome economic growth. Qualitative analysis is needed. The critical question is whether the components of the economy responsible for the GDP are needed for addressing human and nature's needs or are they promoting the increasing threat of climate catastrophe and ecosystem collapse? Nevertheless, it is essential to recognize that decoupling economic growth from bad outcomes under capital reproduction in GGND will only be partially realized unless a robust ecosocialist transition is achieved. Hence it is no surprise that decoupling in capitalist economies has been so far at best very modest (Hickel 2018; Schmelzer, et al. 2022).

Returning to the challenge of climate security, degrowth low-energy mitigation scenarios fall short of achieving this goal as well as leaving the global South with energy poverty (Grubler et al. 2018; Keyßer and Lenzen 2021). They are characterized by low GDP, no negative emissions technologies other than enhancing soil carbon stores, and global reduction in energy consumption. We have argued that if implemented they would leave the world with an insufficient global energy capacity for climate mitigation and adaptation, risking breaching the 1.5°C warming target. In contrast, our scenario would entail a moderate to high GDP, creating high global wind/solar power capacity, and once sufficient wind/solar power is in place the likely implementation of direct air capture of carbon dioxide/permanent storage in the crust (Schwartzman and Schwartzman 2021).

Confronting the Challenge of Extractivism

There are two extractivist challenges, the mining of fossil fuels and of metals used in renewable energy technologies driven by "green" capital. Extractivism is a very real challenge that must be confronted in a wind/solar transition terminating fossil fuels to create a truly just process which protects the rights and health of indigenous people around the world, along with the workforce and communities affected. There are significant future opportunities to limit mining in this transition, namely recycling the huge supplies of metals now embedded in the fossil fuel and military infrastructures with the phasing out of the Military Industrial Complex, substituting common elements for rare ones (e.g., batteries using sodium/sulfur, iron/air, liquid air energy storage, etc.), enhancing electrified public transit instead of manufacturing hundreds of millions of electric cars (Schwartzman 2022a). There are now significant energy savings in recycling metals instead of mining their ores:

> …recycled aluminum metal (e.g., in the form of cans), which can be simply cleaned and re-melted, saving 94% of the energy that would be required to produce the aluminum from ore…The largest energy savings achieved by recycling are generally for metals, which are often easy to recycle and otherwise typically need to be produced by energy-intensive mining and processing of ore. (AGI n.d.)

In other words, "Yet today, only a third of aluminum comes from recovered sources...and a surprising share of aluminum cans are simply trashed" (Chalasani et al. 2023).

Green capital creating the renewable energy infrastructure is of course also a driver of extractivism with its negative impacts on nature, communities, and its workforce. In this regard, recognition of this critical challenge should inform the development of global renewable energy supplies including the need for democratic input and management, the challenge of "green" colonialism especially in the context of the COP process, and the goal of a truly just transition away from fossil fuel dependence (Ajl 2021; Hamouchene and Sandwell 2023). Therefore, a transnational movement must also confront green capital with the goal of minimizing these impacts, with full respect for the rights of the peoples impacted, notably indigenous communities around the world and peoples in the global South.

As the renewable energy supplies grow globally, using this energy to recycle would sharply reduce greenhouse emissions as well as mining. These opportunities reinforce the need for a renewable energy transition increasingly informed by an ecosocialist agenda, especially global demilitarization and social governance of production and consumption.

I close this section with a mention of COP29 held in Baku, Azerbaijan. While modest gains were the result in addressing financing to address the climate crisis in the global South, the ongoing domination of fossil capital on the climate agenda had not been undermined. A future for 2.7°C warming based on current policies is projected (Taylor 2024). Global carbon emissions from fossil fuels will reach a record high in 2024, according to just published research from more than 120 scientists now under review. They report that there is still no indication that the world has reached a peak in fossil CO_2 emissions (Friedlingstein et al. 2024). The assessment of David Wallace-Wells (2024) of the *New York Times* is similarly alarming, and he does cite favorably Malm and Carton's (2024) book, *Overshoot*.

The Global Green New Deal, a Potential Strategic Path Forward: Obstacles, Alliances and Necessary Political Capacity

Here are three theses to frame this discussion of a GGND: First, nothing teaches like experience, hence mass struggle for radical reforms provides the school for growing ecosocialist consciousness with the goal to end the rule of capital. Second, is capitalism now in terminal crisis? Let's not find out, rather terminate it before it drives us and our children's future to climate hell. And third, is global solar capitalism possible or a mirage? I submit it is a mirage because overcoming the obstacles to the prevention of much worse catastrophic climate change (C3) than we now witness will be a path forward to end the rule of capital on our planet in an ecosocialist transition.

The concept of a GGND came to international attention with the United Nations Environment Programme (UNEP) report issued in March 2009 (Barbier 2009; UNEP 2009) as a green path out of crisis (Aşıcı and Bünül 2012). The Green New Deal (GND) has been championed as a green Keynesian reprise of the New Deal, with the potential of generating millions of new jobs both in the energy conservation/clean energy sector and for the repair of physical infrastructure.

It is important to note the contributions of the Green Party of the United States (GP) to making the link between the GGND, climate change, and the U.S. imperial agenda. The embryo of an ecosocialist GND was launched in an initiative of Howie Hawkins who was running for Governor of New York State. This GND was further introduced by the GP into the U.S. political discourse during recent presidential elections by Dr. Jill Stein (2008, 2012), and by Howie Hawkins (2020)[2]. The GP's GND includes cutting the military budget and ending the imperial U.S. foreign policy, which is in utter contradiction to the agendas of both the Republican and Democratic Party leadership. This GND from 2020 promoted a detailed plan which included a commitment to reducing emissions throughout the world, including providing $200 billion to the Green Climate

[2] See the Green New Deal of the Green Party at https://www.gp.org/green_new_deal

Fund, rejoining the Paris Agreement, and reasserting the United States' leadership in the global fight against climate change. Sanders' GND was coupled with a pledge to cut military spending[3]. This represented a welcome addition to the historic GND Congressional Resolution, introduced in 2019 by Alexandria Ocasio-Cortez (D- NY)[4].

Aronoff and colleagues (2019) and Klein (2019) make excellent cases for the GND, but neglect to discuss how imperialism/militarism impacts our climate challenge; Rifkin (2019) argues that green capital will deliver a GND, ignoring the role of class struggle. Kali Akuno, Cooperation Jackson, discusses the relation of the GND to the global struggle for ecosocialism[5]. Likewise, the Democratic Socialists of America had their own version of an ecosocialist GND[6]. In 2019, the UK Labour Party issued a very detailed GND program, and so did the European Union[7], following Yanis Varoufakis' (2014) earlier initiative. More recently green socialists produced a comprehensive program for an ecosocialist GND in Britain, with concrete goals for climate/energy, agriculture/food, the environment, and the economy (Green Left 2022).

Examples of the critical obstacle of fossil capital (in particular the coal and natural gas industries) and its political instruments include the blocking the passage of President Biden's very modest version of a U.S. GND, "Build Back Better" by Senator Manchin (D-WV), along with Biden's reversal from his campaign pledge to block oil well development on federal land and approval of a massive new fracked gas pipeline (Flavelle and Tate 2022; Stein and Pager 2022) Meaney (2022) and Polychroniou (2023) give insightful analyses of these developments including the problematic embryo of a GND, the Inflation Reduction Act (Bigger et al., 2022).

The GGND should be embraced by ecosocialists as a site of class struggle with the potential of preventing climate catastrophe with a just transition out of militarized fossil capitalism (Schwartzman 2011b). Returning to the strategic challenge to what Callinicos (2007: 36–38), has emphasized is the strategic core of Leninism for this century: "The importance of strategic analysis of capitalism.… The specificity and centrality of politics…"

The analysis of real existing capitalism should be informed by in-depth research on the factions of capital, in particular the sector promoting the continued consumption of fossil fuels ("fossil capital") in contrast the sector promoting implementation of renewable energy technology ("green capital") on both national and global scales. I take note of the valuable research on this subject by Robinson (2018, 2019), Carroll (2020), and Harris (2021).

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[3] See https://berniesanders.com/en/issues/green-new-deal/; https://www.vox.com/2019/5/2/18525580/bernie-sanders-plan-cut-military-spending; https://berniesanders.com/issues/responsible-foreign- policy/

[4] https://www.congress.gov/bill/116th-congress/house-resolution/109/text

[5] https://jacobinmag.com/2019/02/kali-akuno-interview-climate-change-cooperation-jackson

[6] https://ecosocialists.dsausa.org/2019/02/28/gnd-principles/

[7] See "The European Green Deal," https://ec.europa.eu/info/sites/info/files/european-green-deal-communication_en.pdf; "Manifesto for A Green Industrial Revolution," https://labour.org.uk/manifesto/a-green-industrial-revolution/

Harris (2021: 355) aptly sums up the potential of building an alliance with green capital to defeat fossil capital in an unfolding GGND:

> …green capitalism presents the best arena to develop Left counter-hegemony. William Carroll distinguishes between a passive revolution led by climate capitalists, and "energy democracy" as a counter-hegemonic strategy pursued by Left NGOs, unions, and activists.… As Carroll (2020) explains, "To counter a passive revolution one must conduct an anti-passive revolution: a war of position which extends popular-democratic and class struggles...from fossil-fuel power to renewables and from corporate oligarchy to democratic control of economic decisions.

Carroll (2020) advocates fighting for "non-reformist reforms" that can push towards a full ecosocialist transition and defeat climate capitalist reformism.

Is there one nation in which green capital can potentially take the lead for a world of climate security? China is now self-described of having "socialism with Chinese characteristics," or perhaps more accurately is state capitalist with socialist characteristics with a market economy. China now leads the world in renewable energy production with her big green capital sector and can in the next few decades build solar power in the deserts of the Middle East in her Belt and Road Initiative with the capacity of supplying electricity to this region, Africa, and the rest of the world and starting direct air capture of carbon dioxide, sequestering it in permanent burial in the crust (Schwartzman and Schwartzman 2024).

Green capital that is actually invested in wind/solar power implementation is both a potential ally to defeat fossil capital and the driver of the extractive assault on humans and nature. Hence, green capital must be challenged by building a global regulatory regime necessary for environmental, worker, and community protection. This challenge has international dimensions recognizing the coexistence of both transnational fossil and green capita (Carroll 2020; Harris 2021; Robinson 2022) with the potential intervention of the transnational working class as the critical component of the global Subject (Schwartzman and Engel-Di Mauro 2022).

Since the coalition for a GGND must be led by those most affected by the climate/environmental crisis—namely the global working class, indigenous peoples, and social movements around the world, especially in the global South—green capital will be challenged on multiple fronts of transnational class struggle in this process. In particular, the role of women's movements in constituting this Global Subject is of critical importance (Schwartzman and Engel-Di Mauro 2022).

John Bellamy Foster (2019) takes a two-stage approach, which he calls "ecodemocratic and ecosocialist." Foster also sees the danger of "Green Keynesianism," where the promise of unlimited jobs, rapid economic growth, and higher consumption militate against any solution to the planetary ecological crisis. Instead, he hopes that a broad popular mobilization will advance from an ecodemocratic platform lacking a critique of capitalism, to a movement growing to an ecorevolutionary opposition. Harris (2021: 355–356) emphasizes,

> The strength of the Green New Deal is its incorporation of social justice issues. This links the environmental movement to the struggle against racial capitalism, creating a bond between the two most dynamic and strategic Left visions capable of building counter-hegemony. Both strike at the heart of authoritarian capitalism. Just what type of alliances, political methods, and organizational forms will develop to build counter-hegemony will prove complex and challenging. The pace of the environmental crisis, the response of green reformism, and the strength of the authoritarian project will largely determine Left strategy and tactics. But clearly the fate of humanity and the planet have never been so intertwined.

I take the analyses of Carroll and Harris (2024) seriously in their arguments for precisely the approach of utilizing the contradictions among capital, fossil, and green, while recognizing their overlap in the big corporate and the finance sectors (Harris 2016, 2021; Carroll 2020). I argue that this potential exists and will only bear fruit as a result of a change in the balance of power in the capitalist state in favor of the working class and its allies by virtue of class struggle. Therefore, the following hopefully provides more insight into what "green" capital is globally.

What is "Green" Capital? "The Good, Bad, and the Ugly"

"The Ugly"

While fossil and green capital overlap especially in big oil companies, they continue to invest heavily in new oil/gas extraction projects, with much smaller funding into renewables to capture profits when their prices are inflated (*As You Sow* 2023; Toke 2024; Urgewald 2024). Since the consumption of fossil fuels must peak very soon and then fall rapidly with the phase out of coal and natural gas being prioritized, as Malm and Carton (2024) point out this massive new investment is a huge threat to the climate protection agenda.

"The Bad"

Further, sections of "green" capital are simply parasitic on the financing provided by the state ostensibly set aside for clean energy creation, the rentiers of the low-carbon economy (Knuth 2021; Knuth et al. 2022; Huber 2022).

"The Good"

My definition of the "Good" is capital which implements wind/solar power and complementary energy storage technologies, invests in agroecologies, and restoration of natural ecosystems providing carbon sinks. And in the late phase in a solar transition this will include direct air capture of carbon dioxide with permanent storage in the crust. China has the biggest renewable energy-creating sector in the world, with its government playing a critical role in financing (Zhang, Song, and Nedopil 2024). Existing examples of Green Capital include Iberdrola SA (IBDRY), the largest renewable energy company in the world; Vestas Wind Systems, and Jinko Solar Holding Co. Ltd, a China-based solar power company (Johnston 2024).

The Climate Denialist Trump Administration and the Challenge to Defeat Fossil Capital

Given its climate denialist agenda, we can expect very little challenge in the United States to fossil capital on the part of green capital which is likely to be its partner in seeking federal funding. However, in blue states with the Democratic Party in power, there may be opportunities to move forward with renewable energy coupled with curbs on fossil fuel consumption. Globally, the critical goal for climate protection can only be achieved with stronger political power aimed at defeating fossil capital's agenda. This should be a component of the political left's platform to win popular support by prioritizing the material and health benefits of a just transition away from fossil fuels.

State policy regarding regulation and financing now and in the future will be a site for class struggle to accelerate both the phaseout of fossil fuel and the creation of renewable energy capacity (e.g., Harris 2016, 2021; Carroll 2020; Toke 2024). And precisely at this state level, with potential impact on the agendas of transnational state formations, is the opportunity to generate support from green capital to defeat the lobbies of fossil capital. Such an opportunity in the United States potentially existed if Harris and Democrats in Congress had prevailed in November 2024, recognizing that unlike Trump/Republicans, the Democrats are not climate denialist, though still strongly influenced by the fossil capital lobby. As one reviewer pointed out, another potential ally in a coalition to defeat fossil capital is the politically ambiguous cadre class of state and corporate employees with technical/professional expertise who coordinate complex divisions of labor, particularly such cadres within green capital. This challenge of defeating fossil capital and the potential role of green capital should be a focus of priority research, including the growing impact of cloud capital (Yaroufakis 2024).

A critical goal will be to shift subsidies from fossil fuel to the good green sector. In 2022, the direct subsidies (undercharging for supply costs) to fossil fuels was 18 percent of total subsidies (direct and indirect) equal to $7 trillion, that is, $1.3 trillion. The indirect subsidies amounted to $5.7 trillion of health and environmental costs not accruing to fossil fuel producers (Black et al. 2023). Shifting this along with the global military expenditures to climate protection and human needs is an ongoing challenge. But the Military Industrial Complex (MIC) is the biggest single obstacle to preventing climate protection for a number of reasons. First, it is the present core of global capital reproduction with its colossal waste of energy and material resources. Second, the fossil fuel and nuclear industries are integrated within the MIC. Third, the MIC has a dominant role in setting the domestic and foreign policy agenda of the United States and other leading capitalist countries. Fourth, the Pentagon is the "global oil-protection service" for both the U.S. imperial agenda and the

they say (Heron and Dean 2020),

> "The struggles to implement the GND and GIR tell us that environmentalists are increasingly aware of the need to seize the state—and the need to develop a fighting organization with the capacity to do so...Conceiving the state as a form for the collective power of working people, an instrument through which we remake the economy in the service of human and nonhuman life…The state is a ready-made apparatus for responding to the climate crisis. It can operate at the scales necessary

> to develop and implement plans for reorganizing agriculture, transportation, housing, and production. It has the capacity to transform the energy sector. It is backed by a standing army. What if all that power were channeled by the many against the few on behalf of a just response to the climate crisis?"

If we take this as a recognition of achieving some degree of working-class power even in a capitalist state it would be a clear departure from Marxist-Leninist formulations of the state as simply the dictatorship of the bourgeois, a departure along the lines of the thinking of Nicolas Poulantzas (1978) and Bob Jessop (1990).

I submit that the class struggle over the valorization of labor power, including the global conditions for its reproduction, manifests itself in the balance of power in the capitalist state. Lebowitz (2003, 2010) has argued that the conditions for the reproduction of labor power is itself a site of multi-dimensional class struggle, with profound insights into how this struggle necessarily entails the development of human potential, only achieving full fruition in self-managed socialism. "…it is the class struggle which plays the decisive role. It is the factor which ultimately determines both the value and price of labor power" (Harvey 1983: 343–344). Laibman (2012: 286) stresses the critical role of class struggle in determining this valorization:

> Labor power is, always and necessarily, a special commodity, never subject to full valorization like other commodities. Its value is always the outcome of the balance of class forces ("balance" here in the sense of "relationship" or "correlation," with no implication of "equilibrium" or any sort of inherent equality or consistency).

So, besides the wage level, this class struggle is directly tied to the material interest of the working class including the impacts of fossil fuel consumption at every scale, from harmful air, water and soil pollution to global climate change. Gilbert (2022) and Mezzadri (2022) make the case for the super-exploitation of the global South, the "remuneration of labor power below its value" with unpaid domestic labor of social reproduction playing a critical role. The working class and its families of the global South must be recognized as an essential component of transnational class struggle in this process of self-valorization. The process of self-valorization by the working class within the capitalist society (Cleaver 1992) is not only creating prefigurations of the future but is a critical component of the valorization of labor power, hence advances the power of the working class breaking out of the constraints of capital reproduction towards the ecosocialist horizon. In this regard, Nancy Fraser theorizes multidimensional transnational class struggle: "Here…are four 'contradictions of capitalism'—the ecological, the social, the political, and the racial/imperial" (Fraser 2023: 24)." She continues, "What counts as an anti-capitalist struggle is thus much broader than Marxists have traditionally supposed" (Fraser 2923: 25), that "their emancipatory potential should consist in their capacity to envision new configurations, not 'merely' of the economy, but also of the relation of the economy to society, nature, and polity" (Fraser 2023: 26).

The critical political tipping point we must fight to reach before climate tipping points kick in can only come with creating a global movement uniting the broadest coalition possible to defeat fossil capital and its political instruments, one led by the working class and its allies, notably indigenous communities around the world, a coalition which includes sections of capital,

so-called green capital, while vigorously confronting the latter's agenda of extractivism (see discussion of this challenge in Schwartzman [2022a]). This strategy is reloading Lenin in the twenty-first century as Eco-Leninism (Malm 2020a, 2020b) today, creating the Global Green New Deal as an arena for transnational class struggle, building the capacity of the global working class and its allies as a hegemonic force for ecosocialist transition. In his *Jacobin* interview Malm (2020b) says

> The whole strategic direction of Lenin after 1914 was to turn World War I into a fatal blow against capitalism. This is precisely the same strategic orientation we must embrace today—and this is what I mean by ecological Leninism. We must find a way of turning the environmental crisis into a crisis for fossil capital itself.

I point to Lenin's ([1920] 1999: 23) advice,

> The more powerful enemy can be vanquished only by exerting the utmost effort, and by the most thorough, careful, attentive, skillful and obligatory use of any, even the smallest, rift between the enemies, any conflict of interests among the bourgeoisie of the various countries and among the various groups or types of bourgeoisie within the various countries, and also by taking advantage of any, even the smallest, opportunity of winning a mass ally, even though this ally is temporary, vacillating, unstable, unreliable and conditional. Those who do not understand this reveal a failure to understand even the smallest grain of Marxism, of modern scientific socialism in general.

And as Andreas Malm (2020b) said in his 2020 interview,

> In order to stabilize the rise of global temperatures at 1.5°C, emissions will have to be reduced by 8 percent a year until you meet net zero [rather real zero!]. This sort of change is totally impossible to do simply by tinkering with market mechanisms or introducing some carbon taxes; rather, it will require a massive expansion of state ownership and comprehensive economic planning.

This strategy promotes first a defeat of fossil capital followed by the defeat of all capital in an ecosocialist transition with democratic social management of society, not by CEOs of corporations and their political instruments.

Faber (2023) emphasized that defeating fossil capital in the United States with its manifestation as the "Polluter-Industrial Complex" with the far right its strongest ally is consistent with continuing opposition to the imperialist agenda of the Democratic Party leadership. Unfortunately, the victory of Trump/Republicans in 2024 was a big critical step backwards to overcoming this challenge, to advance a GND informed by an ecosocialist vision.

Among the ecosocialist left, I welcome Ajl's (2021) proposal for a "movement of movements" grounded in global class struggle for an ecosocialist/internationalist/anti-imperialist GGND. A critical issue to be examined is what forms of political organization will be needed to crystalize a "movement of movements" with sufficient power to overcome both national and transnational capital and their political instruments. Heron and Dean (2022) recognize speaking to the coalitions of the global exploited and oppressed,

> These coalitions cannot be assumed. They must be composed in and through shared struggles, acts of solidarity, and party-building. Climate Leninism requires building coalitions between Indigenous peoples, workers in the Global North, smallholder farmers and pastoralists, women, racialized communities, and other oppressed and exploited groups on issues of ecological, economic, and political significance.… Climate Leninism reminds us that we cannot—as many Marxists do—fetishize the industrialized, unionized, worker of the Global North or pursue national green transition programs without considering their impact on the Global South's lands and labor.

Further they wrote:

> What is our strategy? What are our immediate tactics? This is a problem that can't be avoided.… Unless there is a revolution, the next couple of decades will be defined by a struggle between competing capitals—fossil capital on the one side, "green" capital on the other, with finance capital taking its cut from both—vying for a greater share of the world's ever increasing and unsustainable use of energy. (Heron and Dean 2022)

But why pose the imperative of revolution emerging before this struggle between competing capitals, if the defeat of militarized fossil capital and its imperial political instruments is the critical immediate objective to prevent climate catastrophes as well as the window of opportunity for opening a revolutionary path forward? Rather the challenge of class struggle-driven capacity building should be put in this context of the struggle between fossil and green capital embedded in an unfolding GGND in an ecosocialist direction, the revolutionary path forward. The role of revolutionary parties is to help coordinate this struggle at every spatial scale while playing a critical role in building this capacity, for example, by transnational union organization, especially in sectors that emerge in force from the GGND, that is to say, workers in the renewable energy industry, ecosystem restoration, and agroecology sectors. Further, the defeat of fossil capital will eliminate this obstacle to curbing the unsustainable use of energy (fossil fuels) while creating an increasing global supply of renewable energy to eradicate energy poverty and have the capacity for effective climate mitigation and adaptation.

Heron (2024) critiques left eco-modernism with proponents Matt Huber and Robert Pollin examples, while putting himself in the degrowth camp. Not to repeat my disagreements with the degrowthers, I share part of Heron's critique, particularly regarding nuclear power and the need to include anti-imperialist politics in recognizing the global working class as the subject of revolutionary change as I previously argued (Schwartzman 2023b). So, I welcome what Heron (2024) says in his conclusion,

> '"Lenin once said that social chauvinists insist 'upon the "right" of one or other of the "great" nations to rob the colonies and oppress other peoples.' This is the upshot of a politics, such as the left eco-modernist version of class struggle, that denies the presence of value transfers and uneven ecological exchange, that downplays the socio-ecological consequences of continued or expanding material and energetic throughputs, and that takes a national working class, rather than the global working class, as its political subject. … What's needed more than ever is a deep

> reflection on political strategy. How can those of us living in the imperial core leverage our position to win an eco-communist future for all?'

But should we anticipate that green capital, even pushed to its limits by class struggle, could indefinitely postpone the final demise of global capitalism and could actually replace the present unsustainable energy base with a renewable power infrastructure fast enough to avoid breaching the 1.5°C warming target? I submit this prospect appears to be highly unlikely because the legacy and political economy of real existing capitalism alone makes global solar capitalism a delusion (Schwartzman 2011). And at the heart of this legacy is the MIC. It should be noted that confronting proposals for a GND, Green Capitalism, and a Green Economy should take into account the important distinctions and nuances embedded in their details, particularly in relation to the prospects of sustainable development in the global South (Tienhaara 2014).

The experience of attempts to reconvert military production should be studied closely in this regard, since demilitarization should be an essential part of the GND (e.g., Feldman 2006, 2007). A GGND is essential to make possible a robust transition to a global renewable energy infrastructure (FitzRoy 2017). Barca (2015) provides an analysis of the role of labor and trade unions with respect to the creation of a GGND and the challenge of climate change. Kunze and Becker (2015) discuss the role of collective ownership of renewable energy projects, particularly on a small-scale in the European Union in the context of the degrowth concept.

We now witness or can soon anticipate ongoing struggles for social governance of production and consumption on all scales from neighborhood to global. Areas of struggle in this fight have included the nationalization of the energy, rail, and telecommunications industries; municipalization of electric and water supplies; the creation and maintenance of decentralized solar power, food, energy, and farming cooperatives; the encouragement of worker-owned factories (solidarity economy), the replacement of industrial and GMO agriculture with agroecologies; the creation of green cities; and of course organizing the unorganized in all sectors, especially GND workers. All of these objectives should be part of the ecosocialist agenda for struggles around a GND, which of course, must include the termination of the MIC. The struggle for a GGND has many dimensions, including promoting concrete plans for urban areas (e.g., Schwartzman 2019, 2022c). One outstanding example of how to begin is found in Mike Davis' (2010) work which argues for the potential of a radical movement for green urbanism. More recently, in New York City, organizers frame "Degrowth is a corrective prescription for the Global North, not the Global South" (Tyberg and Jung 2021) as a component of revolutionary organizing in this urban context. Brecher (2024) has provided a perceptive analysis of the GND for the United States, the dialectics of the federal versus the local roles.

I propose consideration of the following potential stages of a GGND:

1) NeoKeynesian (applying Modern Monetary Theory), Goal: defeat Militarized Fossil Capital, by a broad alliance including "green" capital "Green" capital must be challenged all along the way, to optimize environmental, worker and community protection, while

progressively eroding its power to manage this transition, until full social management is in place.

2) Growing strength of organized labor from renewable energy/green infrastructure jobs, the GGND as an arena of transnational class struggle; growth of community control of renewable energy supplies, agroecologies replacing industrial agriculture.
3) Demilitarization and termination of fossil fuel consumption continues, freeing up vast resources, financing. Transfer of resources from the global North to the South; Nationalization of Critical Sectors of the Economy, especially Energy
4) Global ecosocialist transition led by the transnational working class and its allies.

Strong advocates for implementing the first stage include Chomsky and Pollin (2020). I emphasize "potential," since we can anticipate as have Heron and Dean (2020) that this imagined future will be non-linear, with likely leaps, highly contingent on overcoming the formidable obstacles ahead that can block the unfolding of an ecosocialist GGND. The necessary conditions to overcome them must be anticipated and confronted.

Conclusion

A progressively unfolding ecosocialist GGND driven by building capacity of the transnational working class and its allies is imperative to defeat militarized fossil capital and its political instruments in governments. At the same time green capital must be challenged by building a global regulatory regime necessary for environmental, worker and community protection. According to Lenin ([1929] 1999: 158), "Divergence between dreams and reality causes no harm if only the person dreaming believes seriously in his dream.… If there is some connection between dreams and life then all is well." So little time, such a formidable challenge, but dare to struggle, dare to win! We owe this commitment to the children of the world. My optimism is informed by the global upsurge of the movement to end Israeli genocide of the Palestinian people, with growing ties to the climate justice struggles and organized labor. The GGND is the concrete means to confront present dangers and bring us toward the imagined, hoped for, future, with the potential of facilitating a path to electrified solar communism in the twenty-first century (Schwartzman 1996; Schwartzman and Engel-Di Mauro 2019; Huber 2020; Schwartzman 2022b), the Solarcommunicene (Schwartzman 2020a).

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