

On Technology and Degrowth

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I want to address a problem that seems to arise repeatedly in public discussions about green growth and degrowth. Some prominent commentators seem to assume that the debate here is primarily about the question of technology, with green growth promoting technological solutions to the ecological crisis while degrowth promotes only economic and social solutions (and in the most egregious misrepresentations is cast as “anti-technology”). This narrative is inaccurate, and even a

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A cursory review of the literature is enough to make this clear. In fact, degrowth scholarship embraces technological change and efficiency improvements, to the extent (crucially) that these are empirically feasible, ecologically coherent, and socially just. But it also recognises that this alone will not be enough: economic and social transformations are also necessary, including a transition out of capitalism. The debate is therefore not primarily about technology, but about science, justice, and the structure of the economic system.

It is now well-established that green growth scenarios suffer from a difficult problem. They start with the assumption that the rich countries in the “core” of the world-system should continue to increase aggregate production and consumption (“growth”) for the rest of the century. But growth does not come out of thin air. It requires energy. Rich countries already



High-speed train at Taichung Station, China (January 28, 2007). By Cheng-en Cheng - [Flickr](#), [CC BY-SA 2.0](#), [Link](#).

appropriate extremely high levels of energy—many times more than the rest of the world and vastly in excess of what would be required to provision good lives for all.¹

This high energy use is a problem, not only because it is driving climate breakdown and contributing to the crossing of other planetary boundaries but also because it makes sufficiently rapid decarbonisation (that is, decarbonisation consistent with fair shares of Paris-compliant carbon budgets) very difficult to achieve, even with optimistic assumptions about the speed of renewable energy deployment.² To resolve this issue, green growth scenarios resort to several deeply problematic assumptions.³

First, they assume we can overshoot the Paris Agreement limits now and rely on mass deployment of speculative negative emissions technology in the future (mostly bioenergy with carbon capture and storage, or BECCS), to pull excess carbon out of the atmosphere. Scientists have raised major red flags about this approach. BECCS would require vast tracts of land for biofuel monoculture, up to three times the size of India, appropriated overwhelmingly from the Global South, exacerbating deforestation, soil depletion, water depletion, biodiversity loss, and other ecosystem damages, while constraining food availability. Relying on this approach is unjust and ecologically incoherent. It is also risky, because if, for whatever technological or political reasons, this scheme cannot be scaled in the future, then we will be locked into a high-temperature trajectory from which it will be impossible to escape.⁴

A second major assumption in green growth scenarios is that efficiency improvements can be achieved to an extent that

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radically decouples GDP from energy use. The main problem here is that the assumed rates of decoupling are not supported in the empirical literature—they are well outside even the most heroic documented achievements. Furthermore, empirical studies reveal that in a growth-oriented economy, gains from efficiency improvements tend to be leveraged to expand processes of production and consumption, which tends to erode absolute

reductions in energy or material use.⁵ In short, efficiency improvements are important, but in an economy organised around growth and accumulation they do not deliver the results we need. The problem therefore is not primarily our technology, but rather the objectives of the economy.

Finally, green growth scenarios maintain high levels of energy use in high-income countries by constraining energy use, and therefore development, in the Global South—in some cases to levels that are below what is required for even basic needs.⁶ This approach is obviously immoral and unjust (the term *ecofascist* comes to mind), and clearly unacceptable to

¹ ↪ Joel Millward-Hopkins, Julia K. Steinberger, Narashima D. Rao, and Yannick Oswald, “[Providing Decent Living with Minimum Energy.](#)” — The Jus Semper Global Alliance, April 2022.

² ↪ Jason Hickel, “Quantifying National Responsibility for Climate Breakdown: An Equality-Based Attribution Approach for Carbon Dioxide Emissions in Excess of the Planetary Boundary,” *Lancet Planetary Health* 4, no. 9 (2020): e399–e404.

³ ↪ Jason Hickel et al., “Urgent Need for Post-Growth Climate Mitigation Scenarios,” *Nature Energy* 6, no. 8 (2021): 766–68. A free PDF of this article is available at jasonhickel.org/research.

⁴ ↪ For references, see citations in Hickel et al., “Urgent Need for Post-Growth Climate Mitigation Scenarios.” This text also addresses problems with scaling direct air carbon capture and storage.

⁵ ↪ For references, see citations in Hickel et al., “Urgent Need for Post-Growth Climate Mitigation Scenarios.” See also Anne Berner, Stephan Bruns, Alessio Moneta, and David I. Stern, “Do Energy Efficiency Improvements Reduce Energy Use? Empirical Evidence on the Economy-wide Rebound Effect in Europe and the United States,” *Energy Economics* 110 (2022).

⁶ ↪ Jason Hickel and Aljosa Slamersak, “[Existing Climate Mitigation Scenarios Perpetuate Colonial Inequalities.](#)” — The Jus Semper Global Alliance, May 2023.

Green growth scenarios play loose with science, assume incredibly unjust arrangements, and gamble with the future of humanity—and all of life on Earth—simply to maintain ever-increasing levels of aggregate output in high-income countries, which, as we will see, is not even needed.

Global South negotiators. It is worth noting here, furthermore, that achieving and maintaining a decarbonised economy for high-income countries with their existing levels of energy use (and automobile use) would require extraordinary levels of material extraction for all the energy infrastructure and batteries, most of which will be obtained from the Global South through supply chains that are already in many cases socially and ecologically destructive. Yes, we need renewable energy transition. But needlessly high energy use in rich countries means this transition will be slower and the social and ecological costs will be higher.

In sum, green growth scenarios play loose with science, assume incredibly unjust arrangements, and gamble with the future of humanity—and all of life on Earth—simply to maintain ever-increasing levels of aggregate output in high-income countries, which, as we will see, is not even needed.

Ecological economists point out that when we scale back our assumptions about technological change to levels that are,

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to quote the physicist and ecological economist Julia Steinberger, “non-insane,” and when we reject the idea that growth in rich countries should be maintained at the expense of the Global South, it becomes clear that relying on technological change is not enough, in and of itself, to solve the ecological crisis. Yes, we need fast renewable energy deployment, efficiency improvements, and dissemination of advanced technology (induction stoves, efficient appliances, heat pumps, electric trains, and so on).

But we also need high-income countries dramatically to reduce aggregate energy and material use, at a speed faster than what efficiency improvements alone could possibly hope to deliver. To achieve this, high-income countries need to abandon growth as an objective and actively scale down less necessary forms of production, to reduce excess energy and material use directly.⁷

This brings us to a critically important point. We must be clear about what growth actually is. It is not innovation, or social progress, or improvements in well-being. It is very narrowly defined as an increase in aggregate production, as

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measured in market prices (GDP). GDP makes no distinction between \$100 worth of tear gas and \$100 worth of health care. This metric is not intended to measure what is important for people, but rather what is important for capitalism. Of course, what is important for capitalism is not to meet human needs, or achieve social progress, but rather to maximise and accumulate capital.

If social progress and well-being are our goal, it is not the market value of aggregate production that matters but rather what we are producing (tear gas or health care?), and whether people have access to essential goods and services (is the health care privatised or universal?). This is basic to socialist thought.

⁷ ↪ Lorenze Keyßer and Manfred Lenzen, “1.5 °C Degrowth Scenarios Suggest the Need for New Mitigation Pathways,” *Nature Communications* 12, no. 1 (2021).

Under capitalism, essential goods are either underproduced (public transit) or commodified and priced out of reach of

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working-class households (housing, health care, higher education, and so on). This explains why even in rich countries, despite their high levels of aggregate production, many people cannot make ends meet. In the United States, a quarter of the population lives in substandard housing and nearly half cannot afford health care. In the United Kingdom, 4.3 million children live in

poverty. Why? Because the productive forces are organised around the interests of capital rather than around the interests of people.

Degrowth does not call for all forms of production to be reduced. Rather, it calls for reducing ecologically destructive and socially less necessary forms of production, like sport utility vehicles, private jets, mansions, fast fashion, arms, industrial beef, cruises, commercial air travel, etc., while cutting advertising, extending product lifespans (banning

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planned obsolescence and introducing mandatory long-term warranties and rights to repair), and dramatically reducing the purchasing power of the rich. In other words, it targets forms of production that are organised mostly around capital accumulation and elite consumption. In the middle of an ecological emergency,

should we be producing sport utility vehicles and mansions? Should we be diverting energy to support the obscene consumption and accumulation of the ruling class? No. That is an irrationality that only capitalism can love.

At the same time, degrowth scholarship insists on strong social policy to secure human needs and well-being, with universal public services, living wages, a public job guarantee, working time reduction, economic democracy, and radically reduced inequality.⁸ These measures abolish unemployment and economic insecurity and ensure the material conditions for a universal decent living—again, basic socialist principles. This scholarship calls for efficiency improvements, yes, but also a transition toward sufficiency, equity, and a democratic post-capitalist economy, where production is organised around well-being for all, as Peter Kropotkin famously put it, rather than around capital accumulation.

The virtue of this approach should be immediately clear to socialists. Socialism insists on grounding its analysis in the material reality of the world economy. It insists on science and justice. Yes, socialism embraces technology—and credibly promises to manage technology better than capitalism—but socialist visions of technology should be empirically grounded, ecologically coherent, and socially just. They should emphatically not rely on speculation or magical thinking, much less the perpetuation of colonial inequalities. Green growth visions fall foul of these core socialist values.

We can see the double movement of efficiency plus sufficiency clearly in the published postgrowth and degrowth macro-economic scenarios. The Eurogreen degrowth model, for example, starts with a baseline business-as-usual scenario, and then first adds efficiency measures (including things like carbon pricing, efficiency improvements, innovation, electrification, renewable energy transition, and so on), and then on top of this adds transformative

⁸ ↪ Jefim Vogel et al., "Socio-Economic Conditions for Satisfying Human Needs at Low Energy Use," *Global Environmental Change* 69 (2021).

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economic and social policies (reduction in less necessary production, shorter working week, a job guarantee, wealth taxes, etc.), to deliver the results.⁹ This same two-part approach is taken by the LowGrow model.¹⁰ In fact, this is true even of the original MIT World3 “stabilisation

scenario” from the 1970s: it first deploys the measures from the “comprehensive technology” scenario and then adds output stabilisation on top.

We can see the same principles in a recent study on transport-sector decarbonisation in high-income countries published in *Nature*. The authors write: “We conclude that, as well as implementation of emission-reducing changes in vehicle design, a rapid and large-scale reduction in car use is necessary to meet stringent carbon budgets and avoid high energy demand.”¹¹ In other words, yes we need to transition to electric vehicles—but we also need to scale down the automobile industry at the same time, while improving and expanding public transit options to ensure mobility for all. Efficiency, yes. Technological innovation, yes. But sufficiency and equity too.

This approach is also taken in the recent “decent living energy” model scenarios, which have become a touchstone in degrowth research.¹² These scenarios assume strong

The results indicate that if we take this two-part approach (technological innovation and sufficiency), it would be possible to ensure decent living standards for a global population of ten billion people while reducing energy use and decarbonising fast enough to limit temperature rise to less than 1.5°C by the end of the century.

efficiency improvements and advanced technology, while also organising production around sufficiency and human needs, and dramatically reducing inequality.¹³ The results indicate that if we take this two-part approach (technological innovation and sufficiency), it would be possible to ensure decent living standards for a global population of ten billion people—more than the projected midcentury peak—while

reducing energy use and decarbonising fast enough to limit temperature rise to less than 1.5°C by the end of the century. A brief note: all of these models have their weaknesses, and researchers are developing a new generation to account for a more comprehensive range of degrowth policies, including strategies of decolonisation and radical North-South convergence in the world economy.¹⁴

So, the public debate about degrowth founders on a false dichotomy. The real conflict is not between technology and anti-technology. It is about how technology is imagined and the conditions under which it is deployed. Degrowth research makes a strong claim to having a more scientific (and more just) approach to technological visions.

What about the question of technological progress? In media discourse capitalist growth is often conflated with—or even seen as necessary for—technological progress. But here again, this is sloppy thinking.

⁹ ↪ Simone D’Alessandro, André Cieplinski, Tiziano Distefano, and Kristofer Dittmer, “Feasible Alternatives to Green Growth,” *Nature Sustainability* 3, no. 4 (2020): 329–35.

¹⁰ ↪ Peter Victor, *Managing without Growth* (Cheltenham: Edward Elgar, 2018).

¹¹ ↪ Lisa Winkler, Drew Pearce, Jenny Nelson, and Oytun Babacan, “The Effect of Sustainable Mobility Transition Policies on Cumulative Urban Transport Emissions and Energy Demand,” *Nature Communications* 14, no. 1 (2023).

¹² ↪ Millward-Hopkins, Steinberger, Rao, and Oswald, “[Providing Decent Living with Minimum Energy.](#)”

¹³ ↪ Joel Millward-Hopkins and Yannic Oswald, “Reducing Global Inequality to Secure Human Wellbeing and Climate Safety,” *Lancet Planetary Health* 7, no. 2 (2023): e147–e154.

¹⁴ ↪ Jason Hickel, “How to Achieve Full Decolonization,” *New Internationalist*, October 15, 2021.

Yes, we need innovation to solve the ecological crisis. We need better solar panels, better insulation, better batteries, better recycling, better methods for producing steel, etc. But we do not need aggregate growth to get these things. If the objective is to achieve specific kinds of innovation, then target those directly rather than grow the whole economy indiscriminately and hope it will magically deliver the innovation we need. Is it really reasonable to grow the plastics industry, the beef industry, and the advertising industry in order to get more efficient trains? Does it really make sense to grow dirty things in order to get clean things? We must be smarter than that. Necessary innovations can be achieved directly – through public investment in innovation – while simultaneously scaling down less necessary forms of production. In fact, the former is enabled by the latter. Engineering talent that is presently organised around developing, say, advertising algorithms, can be remobilised instead to develop better renewables and transit systems.

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Furthermore, we should note that capitalist growth imperatives quite often limit technological progress. Under capitalism, firms organise innovation not around socially necessary objectives, but rather around what serves their growth and profits. So we get innovations to maximise fossil fuel extraction, or maximise planned obsolescence, but precious little in areas that are clearly necessary but less profitable (such as renewable energy) or not profitable at all (such as public transit, repairable products, or medicines for neglected tropical diseases).¹⁵ Furthermore, even when innovations are socially beneficial, they are often locked up under patents that prevent rapid dissemination (as with the COVID-19 vaccines and battery technology).

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In a democratic socialist scenario, these limitations could be overcome. We could liberate innovation to serve society and ecology rather than profit, invest directly in the innovations we so urgently need, and ensure rapid dissemination of necessary technologies.

It should be clear from the above that degrowth is best understood as an element within a broader struggle for ecosocialist (and anti-imperialist) transformation. We must achieve democratic control over finance, production, and innovation, as well as organise it around both social and ecological objectives. This requires securing and improving socially and ecologically necessary forms of production while reducing destructive and less-necessary output.

Finally, it is worth pointing out that our understanding of what counts as technology should not be limited to complex machinery. Sometimes simpler technologies are more effective, more efficient, and more democratic: bicycles, for instance, are an incredibly powerful technology for helping to decarbonise urban transport, and agroecological methods are vital to restoring soil fertility. Furthermore, the power of social technologies should not be underestimated. To cite a classic example from feminist socialist literature: dishwashers and washing machines are critical to liberating people (and particularly women) from labor, but so too are public child care and community kitchens. We must take care to ensure that our visions of technology are not polluted and constrained by capitalist assumptions and worldviews. A better technology is possible.

¹⁵ ↪ Brett Christophers, "Fossilised Capital: Price and Profit in the Energy Transition," *New Political Economy* 27, no. 1 (2021): 146–59.

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