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The high-energy planet

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ABSTRACT

A key part of the ecomodern discourse of a 'Good Anthropocene' is the vision of a 'high-energy planet' characterized by universal access to modern energy. Recognizing the crucial historical role that rising energy consumption has played in driving social transformations, ecomodernists imagine a future with substantial global equality of opportunity powered by clean and abundant energy. Whereas traditional environmental thinking has advocated land-intensive distributed forms of renewable energy, ecomodernists have argued that such technologies are fundamentally incompatible with a world in which 7–10 billion people can live modern lives. Instead, ecomodernists believe that only breakthrough innovation can overcome the current political and cultural polarization surrounding climate change and provide a unifying pathway towards climate stability. Yet, resurging populism and nationalism, but also the statist frame of the United Nations Framework Convention on Climate Change process, make such a future unlikely as rich countries remain focused on meeting their own domestic emissions targets rather than decarbonizing the global economy as a whole. As a consequence, overall political polarization is bound to increase as radical environmental voices will call for ever harsher demand-side reductions while technocratic elites may come to see solar radiation management as the only feasible way of preventing an irreversible destabilization of the climate system.

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> Thank you industrialization. Thank you steel mill. Thank you power station.
> And thank you chemical processing industry that gave us time to read books.
> Hans Rosling, 1948–2017

Introduction

Fierce as the conflict over the science of climate change has been, many have argued that the underlying source of contention has not so much been competing theories of atmospheric physics as the divisive politics of mitigation.[1] With both concentrations of

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[1] M. Brown, 'Climate Science, Populism, and the Democracy of Rejection', in *Culture, Politics and Climate Change: How Information Shapes our Common Future*, eds. D.A. Crow and M.T. Boykoff (London: Earthscan, 2014), 129–45, 136; D. Jamieson, *Reason in a Dark Time: Why the Struggle Against Climate Change Failed – and What it Means for Our Future* (Oxford: Oxford University Press, 2014), 74.

greenhouse gases in the atmosphere and global average temperatures continuing to soar,[2] it is becoming increasingly clear that climate stabilization will require radical political action. Yet, in a world of 7.6 billion people with widely shared material aspirations, the direction and content of that political action, however, remain as uncertain and controversial as ever.[3]

In 2015, the *Ecomodernist Manifesto* brought further fuel to the fire by suggesting that not only could life in the Anthropocene be made tolerable but that breakthrough technological innovation, if applied with wisdom, held the key to a 'good, or even great, Anthropocene' in which all of the world's inhabitants will be able to live prosperous lives.[4] Turning traditional environmental thinking on its head, the authors behind the manifesto argued that rather than harmonizing with nature and reducing energy use, humanity should seek to more fully separate the economy from nature and invest in clean, dense and abundant energy sources that would make possible both universal human flourishing and large-scale rewilding. This contrarian vision of a 'high-energy planet' became the theme of the 2014 Breakthrough Dialogue (an annual event organized by the ecomodernist think tank *The Breakthrough Institute*) and the aim of this piece is to further elaborate on what such a vision would entail, while also highlighting its limitations in terms of political realism.

At a time when the future again seems most uncertain and the ascending global imaginary is igniting new ideological conflicts,[5] there is a pronounced lack of debate about what a sustainable, yet realistic, long-term planetary future would actually look like.[6] Much critical scholarship treats the climate crisis as caused solely by capitalism,[7] ignoring that humans would probably have both needs and wants under any economic system. Similarly, those who argue that the only possible solution to the climate crisis is a radical reduction in material living standards often remain silent about how such a reduction is supposed to win broad democratic support or what to do with any countries that reject demands for ecological austerity. On the opposite side of the political spectrum, outright denial or trivialization of climate risk remains common, in particular in the United States.[8] According to the work of Dan Kahan and others, this is not primarily an issue of lacking scientific literacy but rather one of cultural polarization.[9] Such polarization is perhaps not surprising given how much the geophysical problem of climate change has become conflated with a particular set of political solutions proposed to fight it (and an implicit logic that says that if you accept one you have to accept the other). Since many people on the political Right find these solutions to be detrimental to their values and lifestyles, contesting or even outright rejecting the underlying science has become a way of blocking political action.

[2]G.P. Peters et al., 'Key Indicators to Track Current Progress and Future Ambition of the Paris Agreement', *Nature Climate Change* 7 (2017): 118–22.
[3]M. Hulme, *Why We Disagree about Climate Change: Understanding Controversy, Inaction and Opportunity* (Cambridge: Cambridge University Press, 2009).
[4]J. Asafu-Adjaye et al., An ecomodernist manifesto, 2015, http://www.ecomodernism.org, 6.
[5]M.B. Steger, *The Rise of the Global Imaginary: Political Ideologies from the French Revolution to the Global War on Terror* (Oxford: Oxford University Press, 2008).
[6]R. Karlsson, 'Ambivalence, Irony, and Democracy in the Anthropocene', *Futures* 46 (2013): 1–9.
[7]N. Klein, *This Changes Everything: Capitalism vs. the Climate* (London: Allen Lane, 2014).
[8]A.M. McCright and R.E. Dunlap, 'The Politicization of Climate Change and Polarization in the American Public''s Views of Global Warming, 2001–2010', *The Sociological Quarterly* 52, no. 2 (2011): 155–94; H. Washington and J. Cook, *Climate Change Denial: Heads in the Sand* (London: Routledge, 2013).
[9]D.M. Kahan et al., 'The Polarizing Impact of Science Literacy and Numeracy on Perceived Climate Change Risks', *Nature Climate Change* 2, no. 10 (2012): 732–5.

According to ecomodernism, shifting the focus from the demand side to the supply side would offer a way of breaking this impasse and partially depoliticizing the issue of climate change. By using publicly funded innovation to make clean and reliable energy *significantly* cheaper than fossil alternatives, ecomodernists not only foresee that domestic political divides can be overcome,[10] they also envision that developing countries can accelerate their rise out of poverty while simultaneously decarbonizing their energy supply.[11] Recognizing the crucial historical role that rising energy consumption has played in driving broad social transformations, ecomodernists believe that mere household electrification, for instance through micro-grids, fails to provide the impetus necessary for developing countries to make the transition from agrarian subsistence farming to more productive forms of off-farm employment.[12] Rather than focusing on achieving a nominal measure of 'energy access', ecomodernists argue that the proper aim should be to provide the energy necessary to effectively eradicate poverty and raise overall productivity through comprehensive urbanization and industrialization.[13] Only then, say ecomodernists, will it be possible to imagine a future of open borders and a material basis sufficient to ensure universal welfare provision. It is that prosperous global future which ecomodernists seek to capture in the metaphor of a high-energy planet. Yet, as Roland Barthes once put it, 'only the metaphor is exact'.[14] While ecomodernists may be right that '[t]he course of development followed by virtually all nations demonstrates that people around the world desire a high-energy future',[15] such a view still contains a problematic element of teleology and claims of universality with which ecomodernism has yet to fully engage. If true, it would also make the task of climate stabilization immensely more difficult. On the other hand, it seems equally if not more problematic to treat permanent poverty as the 'solution' to the climate crisis. While few would publicly defend such 'lifeboat ethics',[16] ecomodernists would argue that the practical effect of different forms of carbon conditionality is precisely such sustained poverty. Thanks to a number of donor initiatives, the poor may increasingly have internet connectivity and solar lanterns but again, ecomodernists would argue, this only makes their experience of relative poverty even more unbearable.

All these conflict lines have become further confused by the flux in which we find international politics in the wake of the Trump presidency. Due to a combination of rising protectionism and increasing automation, developing countries may soon find themselves in a state of premature deindustrialization,[17] a condition further aggravated by the lack of reliable energy. Simultaneously, with multilateral institutions under siege, the idea of providing vast monetary transfers to the poor to help them cope with the effects of climate change or to finance the deployment of small-scale renewable energy seems increasingly illusory. Against this backdrop, ecomodernists hope that the vision of a high-energy planet

[10]M. Shellenberger et al., 'Fast, Clean, & (and) Cheap: Cutting Global Warming''s Gordian Knot', *Harvard Law and Policy Review* 2 (2008): 93–118.
[11]R. Karlsson and J. Symons, 'Making Climate Leadership Meaningful: Energy Research as a Key to Global Decarbonisation', *Global Policy* 6, no. 2 (2015): 107–17.
[12]T. Nordhaus et al., 'Debunking Microenergy: The Future Lies With Urbanization', *Foreign Affairs* (2016), 2016-08-30.
[13]M. Bazilian and R. Pielke, 'Making Energy Access Meaningful', *Issues in Science and Technology* 29, no. 4 (2013): 74–8.
[14]E. Tarasti, 'Metaphors, Semiotics and Futures Studies', *Futures* 84 (2016): 120–3, 121.
[15]Bazilian and Pielke, 'Making Energy Access Meaningful', 79.
[16]G. Hardin, 'Lifeboat Ethics: The Case Against Helping the Poor', *Psychology Today* 8 (1974): 38–43, 123–6; J.S. Dryzek, *The Politics of the Earth: Environmental Discourses* (Oxford: Oxford University Press, 2013), 38.
[17]D. Rodrik, 'Premature Deindustrialization', *Journal of Economic Growth* 21, no. 1 (2016): 1–33.

could offer a unifying narrative of progressive global change. Unlike traditional environmentalism that would require a winding down of global trade and, ultimately, a reversal of all the great transformational processes of the last centuries,[18] an ecomodernist future would rather depend on an ever more integrated world with free movement of ideas, people and technology in order to quickly diffuse breakthrough technologies and make possible a rapid displacement of fossil fuels worldwide. Instead of having to impose a shared epistemology and an associated global ethic of restraint, ecomodernists suggest that environmental leading countries should focus on financing breakthrough low-carbon innovations that other countries will then adopt for purely economic reasons as globalization unfolds.

Yet, with the future of globalization itself now at stake, the implications for ecomodernism and the prospects of a high-energy future are both uncertain and contradictory. However, before further exploring this ambiguous political landscape, something more has to be said about the normative foundations of ecomodern thinking.

Social democracy for the Anthropocene

At its core, ecomodernism is a humanist and cosmopolitan philosophy.[19] Unlike post-development theories, ecomodernism imagines a future of global economic convergence in which people everywhere will be able to enjoy the fruits of modernity. While not ignorant of the Western and colonial origins of modernity, ecomodernists believe that the Enlightenment values are universally valid and that there is no acceptable moral excuse for maintaining a divided world in which life opportunities remain overwhelmingly determined by place of birth,[20] a factor that is completely outside the control of the individual. In its stead, and as introduced above, ecomodernists imagine a fully integrated 'high-energy planet' on which all people are able to enjoy global mobility, access to advanced medicine and material plenitude. Contrary to traditional environmental thinking, ecomodernists see the realization of this vision as crucial not only to meet human needs but also to protect and restore the natural world. Whereas traditional environmentalists believe that the root of the ecological trauma is humanity's separation from nature,[21] ecomodernists take the opposite view, that only by more fully separating the natural and the human world can sustainability become possible. In the very long run, ecomodernists envision that practically all terrestrial metabolic processes can be replaced, either through space colonization or by nanoscale manufacturing technologies,[22] but in the meantime, they believe that global trade and more efficient agriculture can spare nature through intensification. With regards to energy, ecomodernists again take the opposite view of traditional environmentalists in that they believe that access to concentrated energy is crucial to prevent the kind of energy sprawl associated with large-scale burning of biomass and

[18]I. Cosme et al., 'Assessing the Degrowth Discourse: A Review and Analysis of Academic Degrowth Policy Proposals', *Journal of Cleaner Production* 149 (2017): 321–34.
[19]E. Crist, 'The Reaches of Freedom: A Response to An Ecomodernist Manifesto', *Environmental Humanities* 7, no. 1 (2015): 245–54, 215.
[20]S. Loriaux, 'Global Equality of Opportunity: A Proposal', *Journal of International Relations and Development* 11, no. 1 (2008): 1–28; D. Moellendorf, 'Equality of Opportunity Globalized?', *The Canadian Journal of Law and Jurisprudence* 19, no. 2 (2006): 301–18.
[21]T. Princen, *Treading Softly: Paths to Ecological Order* (Cambridge, MA: MIT Press, 2010), 82.
[22]K.E. Drexler, *Radical Abundance: How a Revolution in Nanotechnology Will Change Civilization* (New York: PublicAffairs, 2013).

distributed forms of renewable energy.[23] Similarly, mass desalination for agriculture that would spare natural aquifers and water systems would only become possible in a high-energy future.

Given its cosmopolitan grounding, ecomodernism can be said to reflect a universalization principle which evaluates the sustainability of a particular practice on the basis of what the consequences and side-effects would be of its general observance. Rather than assuming that human behaviour and preferences will fundamentally change in the future, ecomodernists would ask 'what kind of technologies would be required to achieve climate stability in a world of 10+ billion people living prosperous lives'[24] and then work backwards from that question. Such an approach does not preclude behavioural change but rather takes as its starting point that any voluntary reductions among the most environmentally conscious are likely to be matched by increasing consumption among others as people move out of poverty. To some extent, this is also a question of political tactics. Whereas many 'mainstream' environmentalists would argue that both technological innovation and demand-side reductions in energy use are needed to effectively combat climate change, ecomodernists would respond that not only must one consider the political opportunity costs of insisting on such demand-side measures (as in generating further political polarization and making compromises more difficult), but that any reductions in domestic energy use may also lead policy-makers to underestimate the true need for a global supply-side revolution.[25]

As such, ecomodernism is essentially a form of social democracy for the Anthropocene. Just like social democracy provided an answer to the conflicted political landscape of the twentieth century,[26] ecomodernists hope that rather than making climate stability contingent on that the poor never 'catch up', a forward-looking vision of global equality and prosperity is needed, one in which accelerated globalization opens up a political opportunity space for environmental action that does not exist today.

In retrospect, social democracy's greatest achievement was not that it managed to strike an appropriate balance between equality and economic growth but that it realized that greater equality, made possible through broad social investments, was in fact the key to sustained economic growth. Similarly, ecomodernism is not so much about finding some ideal balance between environmental protection and material well-being, that golden ratio often referred to as 'sustainable development', but rather about highlighting that only through rapidly accelerating global growth – essentially a renewed modernity – will it be possible to harness the technologies necessary to safely navigate the Anthropocene. Part of this has to do with restoring the notion of progress as a crucial category for talking about change, autonomy or even drawing basic qualitative distinctions.[27] Only by acknowledging that more people today live longer, healthier and richer lives than at any time in human history is it possible to offer a vision of what future progress would look like. In this sense, the work of people like Hans Rosling or Max Roser has been crucial for

[23]A.M. Trainor et al., 'Energy Sprawl is the Largest Driver of Land Use Change in United States', *PloS One* 11, no. 9 (2016): e0162269.
[24]R. Karlsson, 'The Environmental Risks of Incomplete Globalisation', *Globalizations* 14, no. 4 (2017): 550–62, 554.
[25]C. Green, *Mitigation Technology: Half Full or Nearly Empty?* (Nature Climate Change, 2017).
[26]S. Berman, *The Primacy of Politics: Social Democracy and the Making of Europe''s Twentieth Century* (Cambridge: Cambridge University Press, 2006).
[27]S.E. Bronner, *Reclaiming the Enlightenment: Toward a Politics of Radical Engagement* (New York: Columbia University Press, 2006), 18.

challenging the litany of doom and decline that much of the contemporary Left has come to take as almost axiomatic.

At the same time, it is important to recognize that projecting a positive vision of the future is always going to be more existentially demanding than simply lamenting the loss of a romanticized past.[28] Likewise, dreaming of some kind of temporal rupture or the downfall of global capitalism may seem more tempting than taking active political responsibility for a future in which human civilization simply continues to hum on. This is especially so since a more equal and open world will require ever greater measures of reflexivity, moral imagination and self-actualization on behalf of everyone, including those who are currently privileged by national borders and unfair terms of trade. At the same time, the World Value Survey has continuously documented a broad global trend away from traditional 'survival' values towards secular-rational emancipative values and self-expression.[29] Thus, an optimistic reading of history would suggest that the rise of Trump and right-wing populism should not so much be seen as a symbol of the future as a last desperate attempt to defend old patterns of domination and parochialism.

Nevertheless, despite the enormous technological development that has taken place over the last centuries, it is still common to hear that it is simply not physically possible to imagine a future of universal affluence,[30] at least not one that simultaneously protects or even restores the natural world. Sometimes, such technological pessimism is matched by extreme measures of optimism concerning the prospects of behavioural change. Other times, it is part of a more general apocalyptic mind-set which suggests that all that humanity can do at this stage is to 'hunker down'[31] or even 'learning to die as a civilization'[32]. According to Nick Srnicek and Alex Williams:

> A folk-political sentiment has manifested itself in both radical horizontalist and more moderate localist movements, yet similar intuitions underpin a broad range of the contemporary left. Across these groups, a series of judgements are widely accepted: small is beautiful, the local is ethical, simpler is better, permanence is oppressive, progress is over[33]

Contrary to such localism and defeatism, ecomodernists would argue that the emerging global scale in fact represents humanity's greatest hope. Not only have specialization and international trade made human societies far more resilient than in the past,[34] accelerating integration and automation mean that more and more people can work on possible solutions. As societies become richer, they become increasingly able to finance breakthrough technological innovation, as for instance illustrated by China's research into traveling-wave reactors. More generally, progress on intelligent machine labour may eventually lead to a fundamentally different and far more sustainable socio-ecological regime.[35] Yet, for now, all such advances remain hypothetical and contingent on sustained public funding over

[28]N. Srnicek and A. Williams, *Inventing the Future: Postcapitalism and a World Without Work* (London: Verso Books, 2015), 46.
[29]C. Welzel, *Freedom Rising* (Cambridge: Cambridge University Press, 2013).
[30]M. Huesemann and J. Huesemann, *Techno-Fix: Why Technology Won"t Save us or the Environment* (Gabriola Island: New Society Publishers, 2011).
[31]B. McKibben, *Eaarth: Making a Life on a Tough New Planet* (New York: Times Books, 2010), 103.
[32]R. Scranton, *Learning to Die in the Anthropocene: Reflections on the End of a Civilization* (New York: City Lights Publishers, 2015), 24.
[33]Srnicek and Williams, *Inventing the Future*, 46.
[34]D. Deudney, 'The Case Against Linking Environmental Degradation and National Security', *Millennium – Journal of International Studies* 19, no. 3 (1990): 461–76, 470.
[35]A. Dorr, 'Technological Change and Climate Scenarios', *Nature Climate Change* 6 (2016): 638–9.

many decades. However, unlike traditional environmentalism which depends on people everywhere accepting the existence of planetary limits and restricting their material wants accordingly, an ecomodern future could potentially be realized through the committed leadership of a few environmentally conscious countries. For this to happen, it is however crucial that these countries take the issue of global scalability seriously.

Another lost decade

Unfortunately, the last decades have seen the most environmentally conscious countries narcissistically focusing on reducing their own domestic emissions with little thought for the bigger global picture. The statist frame of the United Nations Framework Convention on Climate Change process has further encouraged the use of existing technologies to meet short-term domestic targets rather than the innovation of high-energy technologies capable of decarbonizing the global economy as a whole. While the most affluent countries can possibly afford a renewable energy future, especially as long as much of their heavy industrial manufacturing takes place elsewhere and they are willing to accept a large share of fossil gas for load balancing, such a trajectory can hardly meet the needs of a more equal and fully developed world.[36]

Even as calculations suggest that existing nuclear technologies could theoretically provide clean energy at the scale required,[37] deeply entrenched anti-nuclear sentiments and cultural logics have made the realization of a high-energy planet contingent on breakthrough innovation. While nuclear technologies, broadly conceived, are likely to play a key role in any meaningful innovation effort, progress depends on developing proliferation-resistant technologies that can recycle the existing stockpile of spent nuclear fuel.[38] Whereas the Obama Administration repeatedly increased spending on energy R&D domestically and promoted 'Mission Innovation' internationally, the Trump Administration has instead sought to cut funding to clean energy innovation. Also internationally, the current state of political procrastination is likely to continue and more valuable time will be lost. Instead of a wartime-like mobilization for rapid mitigation,[39] the world seems destined to continue sleepwalking into a period of prolonged emissions overshoot.[40]

In order to avoid a possibly irreversible destabilization of the climate system, much hope is today placed on the development of bio-energy with carbon capture and storage (BECCS) and other negative emissions technologies (NETs). Yet, an increasing number of studies are beginning to highlight the biophysical, social and technological limitations of BECCS.[41] If NETs fail to materialize at the required scale, the only remaining hope would be solar radiation management (SRM). However, unlike NETs, SRM would do nothing to reduce the concentration of greenhouse gases in the atmosphere. While it

[36]I. Arto et al., 'The Energy Requirements of a Developed World', *Energy for Sustainable Development* 33 (2016): 1–13; R. Curren and E. Metzger, *Living Well Now and in the Future: Why Sustainability Matters* (Cambridge, MA: MIT Press, 2017), 24.
[37]S.A. Qvist and B.W. Brook, 'Potential for Worldwide Displacement of Fossil-Fuel Electricity by Nuclear Energy in Three Decades Based on Extrapolation of Regional Deployment Data', *PloS One* 10, no. 5 (2015): e0124074.
[38]B.W. Brook et al., 'The Case for a Near-Term Commercial Demonstration of the Integral Fast Reactor', *Sustainable Materials and Technologies* 3 (2015): 2–6.
[39]L.L. Delina, *Strategies for Rapid Climate Mitigation: Wartime Mobilisation as a Model for Action?* (New York: Routledge, 2016).
[40]Jamieson, *Reason in a Dark Time*.
[41]K. Anderson and G. Peters, 'The Trouble with Negative Emissions', *Science* 354, no. 6309 (2016): 182–3; P. Smith et al., 'Biophysical and Economic Limits to Negative CO_2 Emissions', *Nature Climate Change* 6, no. 1 (2016): 42–50.

may help preventing the worst possible outcomes and protecting critical biodiversity,[42] SRM will always be a stop-gap measure. In addition, the implementation of a SRM programme would probably give rise to a range of alternative epistemologies, some of which may even blame future negative climatic effects on the SRM programme. Already today, conspiracy theories surrounding geoengineering are being widely circulated on the Internet.[43]

With mounting evidence of a worsening climate crisis, traditional environmentalists are likely to become even more vocal in their demands for ecological austerity and carbon rationing. If so, it will further raise the stakes for climate denialists. Barring some unexpected technological breakthrough, ecomodernists will have to fight a long political battle to win broad support for nuclear innovation. Meanwhile, technocratic elites may become increasingly attracted to SRM as a way of staving off the worst climate harms while allowing economic growth to continue.

Conclusions

Unlike traditional environmentalists, ecomodernists have welcomed accelerating globalization as a way of making a high-energy planet politically inevitable; hoping that, as all of the world gets richer, its capacity and willingness to finance breakthrough technological innovation will also increase. However, growing global volatility and resurging protectionism, not the least in the United States, has meant that the future of a rapidly globalizing world is now in itself more uncertain.

Despite the arguments advanced by a growing number of ecomodern authors, it is likely that the current state of political procrastination will continue and that climate radicalism will become even more pronounced in reaction to extreme weather events and other signs of a warming world.

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[42] J. Long, 'Bringing Geoengineering into the Mix of Climate Change Tools', in *Climate Justice and Geoengineering: Ethics and Policy in the Atmospheric Anthropocene*, ed. C. Preston (New York: Rowman & Littlefield, 2016), 109–20.
[43] R. Cairns, 'Climates of Suspicion: "Chemtrail" Conspiracy Narratives and the International Politics of Geoengineering', *The Geographical Journal* 182, no. 1 (2016): 70–84.