Political Science 375

Global Environmental Politics

Bounding Transboundary Processes

A Critique of Incomplete Conceptions and Imbalanced Computations

Word Count: 2499

Ayan Kanhai Aman

0.0 Abstract

Gauging Environmental Sustainability through fundamentally biased conceptions and computations may consequentially foster a false sense of Environmentalism in Nations. Bounding the scale of analysis by 'imagined' geographic borders to assess trans-boundary process systems of resource consumption and emission hence creates an illusion of Sustainability. Therefore, adopting flawed framings of Environmentalism, like Ecomodernism, to determine global responsibilities in mitigating Climate Change may adversely pit policies and policing against currently developing post-colonial nations. To this effect, this discussion evaluates the Environmental Performance Index and Carbon Tax through case studies to highlight their incomplete conceptions and imbalanced computations of Environmental Sustainability. Through a Marxist critique, the study calls for the re-scaling and re-design of such metrics to account for the dynamic patterns of global consumption and proposes that further research must focus on re-establishing localized supply chains, determining methods of equitable carbon accounting, and devising global environmental governance frameworks.

Keywords: *Environmentalism, Environmental Sustainability Index, Carbon Tax, Metabolic Rift*

1.0 Introduction

This paper argues that contemporary metrics used to gauge Environmental Sustainability (ES), do so based on fundamentally flawed conceptions and computations, in turn fostering a false sense of Environmentalism in Nations. The argument is premised on the notion that such metrics are biased owing to an arbitrary decision regarding the scale of analysis i.e. the metrics to asses a globally complex and trans-boundary process system are paradoxically constrained by 'imagined' geographic borders.

The real-world implications of employing such empirically biased metrics will be explored through a brief contextualization in the Ecomodernist proposal of Environmentalism. Through an examination of the trans-boundary nature of resource consumption, this paper will highlight how derivative ideologies of such metrics, like Ecomodernism, are embedded in a theoretically biased worldview, hence serving as a self-fulfilling prophecy. Accordingly, the principal assumption of this discussion is that the metrics, indicators, and concepts critiqued, are ones that would potentially be used to construct the Ecomodernist argument. It is imperative to challenge the presumptions of such conceptions and computations of ES as in the field of Global Environmental Politics, such inappropriate classifications, if accepted extensively, can adversely influence policies and policing, consequently hampering the ability of already-disadvantaged nations to rightfully 'develop'.

This paper will first critique Ecomodernism to uncover its tendentious conceptualisation of ES by exposing the historical and geographical dynamics of resource consumption. Next, the inaccuracies of prevalent metrics and regulatory mechanisms like the Environmental Performance Index and Carbon Taxing will be evaluated in National and Corporate contexts. Later, the paper will discuss the societal implications of such biased framings through a Marxist critique. And finally, it will conclude with recommendations that future policy and research agendas may undertake.

2.0 The Ecomodernist Proposal

At its core, the Ecomodernist proposal for the future of Environmentalism[1,2] is oblivious to the past and present geo-politics of resource-intensive and development-driven 'modernity'. As for the past, Eco-modernists fail to recognize the fact that the modernity they are trying to propagate, is a function of the capitalistic environmental exploitation in the now 'modernizing' world. In doing so, they ignore the post-colonial disadvantage inflicted by the 'developed' and wrongfully place the onus of mitigating Climate Change on the now 'developing', rendering invalid their right to industrialize, modernize, and prosper.[3]

While the Ecomodernist ignorance of the historical context can be forgiven, their naiveness about current practises cannot. In claiming that the modernized societies have virtually attained ES, they discount the implications of current global supply-chains of resource extraction, where the relatively 'decoupled' developed world's needs are met through supply from the now developing. Therefore, the presumption that modernized societies tend to be more sustainable is untrue because their sustainability is calculated based on geographically bounded metrics that emphasize the localized 'decoupling' while conveniently overlooking the colossal impact of their outsourced environmental exploitation. Hence, in employing biased metrics to claim sustainability, the Ecomodernist conception of ES is inherently flawed.

The Environmental Kuznets Curve[4] epitomizes the issue of using geographically bounded metrics to measure trans-boundary process systems. The national delusion of ES is fostered by an improper scaling of the metric, which consequently overlooks their international contributions to environmental degradation. Thus, all this curve demonstrates is that once a Nation transitions to its service-based economy, the levels of environmental degradation within its boundaries fall owing to a post-industrial economy that outsources environmental exploitation.

---

[1] *"**Ecomodernism** is an environmental philosophy which argues that humans should strive to protect nature and improve human wellbeing by developing and deploying technologies that decouple human development from environmental impacts."*
^ "Ecomodernism," Wikipedia (Wikimedia Foundation, September 22, 2020), https://en.wikipedia.org/wiki/Ecomodernism.

[2] John E Asafu-Adjaye et. al, "An Ecomodernist Manifesto," An Ecomodernist Manifesto, 2015, http://www.ecomodernism.org/.

[3] Collard, Rosemary-Claire, Jessica Dempsey, and Juanita Sundberg. "The Moderns' Amnesia in Two Registers." *Environmental Humanities* 7, no. 1 (2015): 227–32. https://doi.org/10.1215/22011919-3616425.

[4] ***"Environmental Kuznets Curve** suggests that economic development initially leads to a deterioration in the environment, but after a certain level of economic growth, a society begins to improve its relationship with the environment and levels of environmental degradation reduces."*
^ Tejvan Pettinger et al., "Environmental Kuznets Curve," November 18, 2019, https://www.economicshelp.org/blog/14337/environment/environmental-kuznets-curve/.

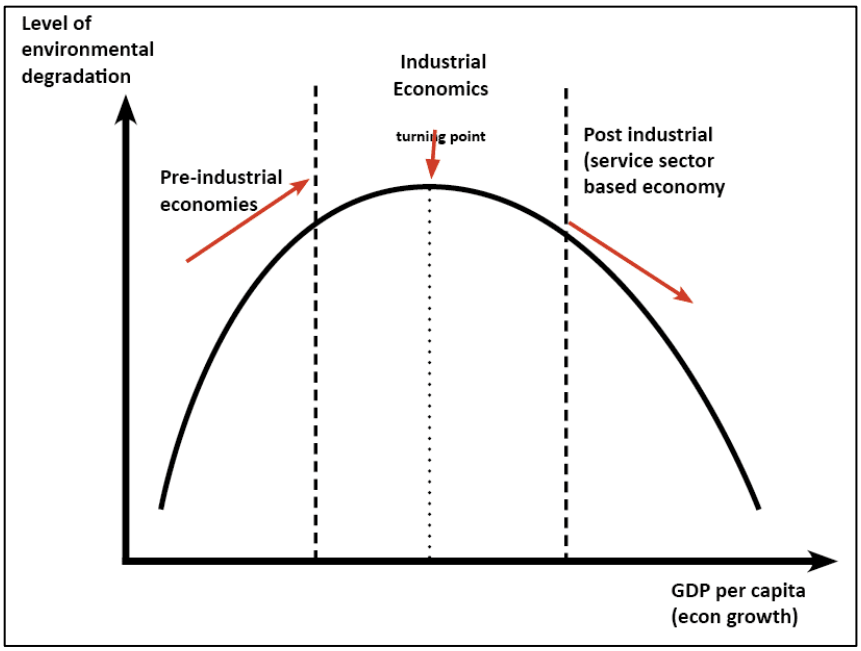

Figure 1: The Environmental Kuznets Curve[5]

In that sense, one could infer that increasing GDP is correlated with increasing 'inward' focusing environmental protection policies which consequently improve local environments. However, these Nations rarely institute an 'outward' focused environmental protection policy. Therefore, while maintaining the same levels of resource consumption, corporations export their supply-chains in order to externalize environmental degradation to Nations with weak regulations and strong incentives to capitalise at the expense of their natural environments.[6]

[5] Tejvan Pettinger et al. Diagram of Kuznets Curve. "Environmental Kuznets Curve," November 18, 2019, https://www.economicshelp.org/blog/14337/environment/environmental-kuznets-curve/.

[6] Castleman, Barry I. "The Export of Hazardous Factories to Developing Nations." *International Journal of Health Services* 9, no. 4 (October 1979): 569–606. https://doi.org/10.2190/Y298-HVAP-L3U2-JMF4.

4.0 Bounding Transboundary Processes

4.1 An Incomplete Conception: National Environmental Performance Index (EPI)

While the EPI[7] is a commendable metric in its intention, it fails to comprehensively measure a Nation's upstream and downstream environmental impacts. Nationally bounded measurements may falsely signal to developed Nations of adequate performance, and hence sustain business-as-usual scenarios. EPI's presumption that with higher levels of development environmental performance improves is reinforced by the graph below that presents a strong positive correlation between GDP and EPI score. Consequentially, such a metric would conceal the ramifications of developed Countries' trans-boundary supply chains and hence their outsourced pollution to developing Countries will remain invariable. Moreover, in the global endeavour to foster ES, the lacking awareness of such intricacies may lead to unfair international pressure to curtail emissions on developing Countries. Therefore, this would further obscure the role of the developed world in cultivating and sponsoring such unsustainable excavation overseas.

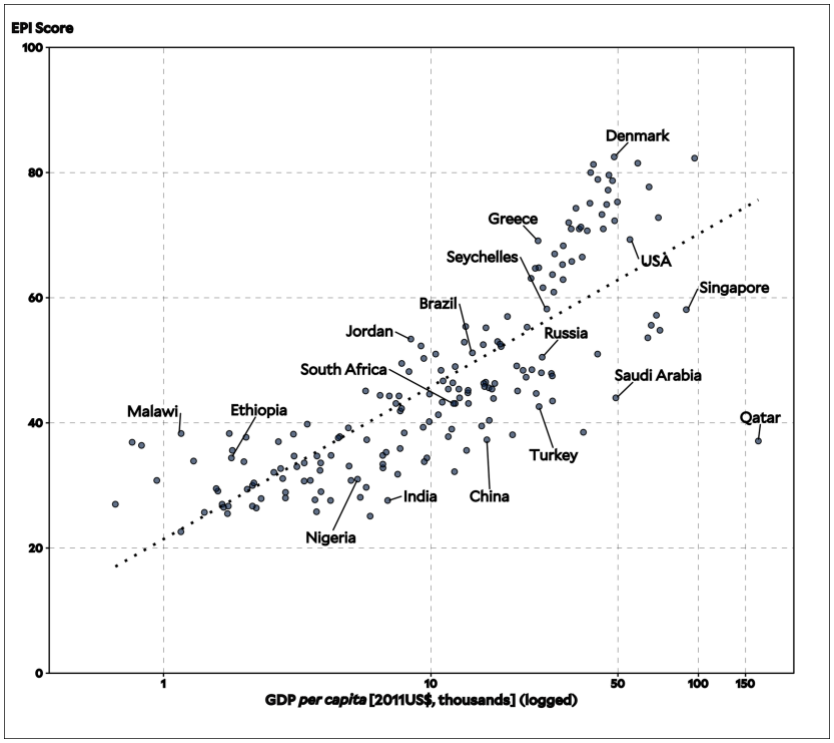

Figure 2: Correlation between EPI and Gross Domestic Product[8]

[7] *"**Environmental Performance Index (EPI)** is a performance-oriented composite index designed to help governments measure progress toward a comprehensive set of pollution control and natural resource management goals by focusing on environmental policy outcomes."*
^ R. Andreas Kraemer, Sascha Müller-Kraenner, and David Campbell, "Review of the Environmental Performance Index (EPI)," Review of the Environmental Performance Index (EPI) | Ecologic Institute: Science and Policy for a Sustainable World (Yale University, School Forestry & Environmental Studies, United States and Robert Bosch Foundation, Germany, October 1, 2005), https://www.ecologic.eu/1711.

[8] The relationship between 2020 EPI Score and GDP per capita. "Environmental Performance Index," EPI (Yale Center for Environmental Law & Policy, 2002), https://epi.yale.edu/.

Case-Study: Switzerland and Nigeria

In 2015, Switzerland's Collombey crude-oil refinery was decommissioned owing to drastic market pressures caused by higher imports of refined petroleum products and increasing regulatory costs.[9] This left the Nation with just one operational crude-oil refinery, the Cressier, that merely, "accounts for approximately 25%, by volume, of all refined products sold nationally."[10] Hence, the abrupt, "decline in domestic refining capacity left Switzerland more dependent on oil product imports."[11]

This suggests that fuels in Switzerland are primarily imported post-refinement, and hence emissions, when measured with respect to processing occurring within Swiss boundaries, appear to be low. This highlights that the EPI is incapable of incorporating a Life Cycle Analysis[12] point of view to compute Swiss Green House Gas (GHG) emissions for the oil processed i.e. instead of a Well-to Wheel calculation, the EPI would only account for Tank-to-Wheel emissions, and ignore the Well-to-Tank processing for the remaining 75% of crude oil that was refined outside Swiss borders.[13]

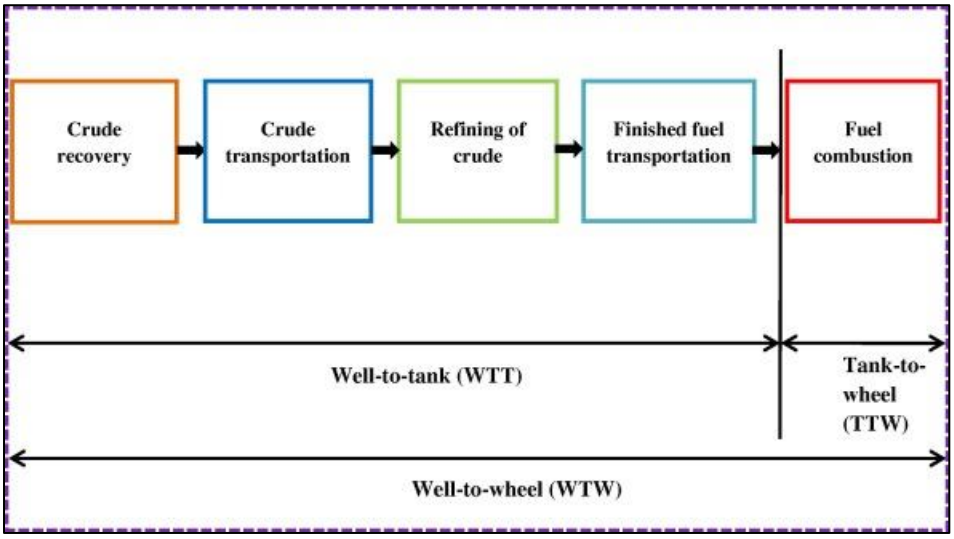

Figure 3: Life Cycle Analysis Model of Crude Oil Processing [14]

[9] Swissinfo.ch, "Tamoil Refinery to Stop Work in Switzerland," SWI swissinfo.ch (swissinfo.ch, November 9, 2017), https://www.swissinfo.ch/eng/business/crude-closure-_tamoil-refinery-to-stop-work-in-switzerland/41214558.

[10] "Where It All Begins: Refining: VARO," VARO Energy, 2018, https://varoenergy.com/en/what-we-do/refining.

[11] Wood Mackenzie, "Energy Research & Consultancy," September 12, 2019, https://www.woodmac.com/reports/refining-and-oil-products-switzerland-downstream-oil-long-term-outlook-43685730.

[12] *"**Life Cycle Analysis** is a methodology for assessing environmental impacts associated with all the stages of the life-cycle of a commercial product, process, or service"*
^ "Life-Cycle Assessment," Wikipedia (Wikimedia Foundation, August 30, 2020), https://en.wikipedia.org/wiki/Life-cycle_assessment.

[13,14] Rahman, Md. Mustafizur, Christina Canter, and Amit Kumar. "Well-to-Wheel Life-Cycle Assessment of Transportation Fuels Derived from Different North American Conventional Crudes." *Applied Energy* 156 (October 2015): 159–73. https://doi.org/10.1016/j.apenergy.2015.07.004.

In 2019, petroleum and other fuels made up about 50.6% of energy sources in Switzerland and 39% of all Swiss crude oil imports were from Nigeria.[15] In the EPI results of 2020, Switzerland ranked 3rd with a score of 81.5 while Nigeria ranked 151st with a score of 31.[16] In not considering the whole Well-to-Wheel emission profile under the Swiss account, the environmental degradation as a result of this processing is attributed to the Nigerian account. In doing so, the Swiss contribution to degradation is overlooked, and Nigeria is held responsible and deemed unsustainable.

For instance, oil spills in Nigeria are a common occurrence and it is, "estimated that 9-13 million barrels of oil have been spilled in the Niger Delta since drilling began in 1958." [17] Subsequently, these oil spills had severe impacts on local ecosystems and an, "estimated 5–10% of Nigerian mangrove ecosystems have been wiped out by oil."[18] Furthermore, "Nigeria flares more natural gas associated with oil extraction than any other country, with estimates suggesting that 70% of associated gas (AG) produced annually is wasted via flaring"[19] as companies operating in Nigeria do not deem AG separation commercially viable. "While the international community, Nigerian government, and oil corporations seem to agree that gas flaring need to be curtailed, efforts to do so have been slow and largely ineffective", highlighting the inefficiency of Nigerian environmental policy, but also their 'inevitable' prioritisation of profits in the race to 'develop'.[20]

[15] "Energy – Facts and Figures," eda.admin.ch, 2019, https://www.eda.admin.ch/aboutswitzerland/en/home/wirtschaft/energie/energie---fakten-und-zahlen.html.

[16] "2020 Results Overview: Environmental Performance Index," EPI, 2020, https://epi.yale.edu/epi-results/2020/component/epi.

[17] Ite, Aniefiok E., Udo J. Ibok, Margaret U. Ite, and Sunday W. Petters. "Petroleum Exploration and Production: Past and Present Environmental Issues in the Nigeria's Niger Delta." *American Journal of Environmental Protection* 1, no. 4 (2013): 78-90.

[18,19,20] "Petroleum Industry in Nigeria," Wikipedia (Wikimedia Foundation, September 29, 2020), https://en.wikipedia.org/wiki/Petroleum_industry_in_Nigeria.

4.2 An Imbalanced Computation: Corporate Carbon Taxing (CT)

According to World Bank, the Carbon Tax[21] is implemented in about 25 countries and, "these initiatives only cover 22.3% of global GHG emissions."[22] A nationally constrained metric for emissions implies that multi-national corporations with global supply chains, are taxed based on an incomplete emission profile. In not accounting for the trans-boundary emissions (upstream and downstream), the instrument considers just a fraction of the supply chain. "Owing to insufficient global cooperation for carbon abatement", Carbon Leakage is a spillover effect that poses the risk of a global rise in carbon emissions. "There are two main channels for leakage: the fuel price channel, where unregulated countries increase fuel demand as international prices get depressed from energy demand reductions of abating regions; and the competitiveness channel, through shift in comparative advantage of emission-intensive and trade-exposed (EITE) industries."[23] The Pollution Haven Hypothesis posits that in newly industrializing countries, "trade liberalisation may lead to specialisation in pollution-intensive activities in some countries if environmental policy stringency differs across countries."[24]

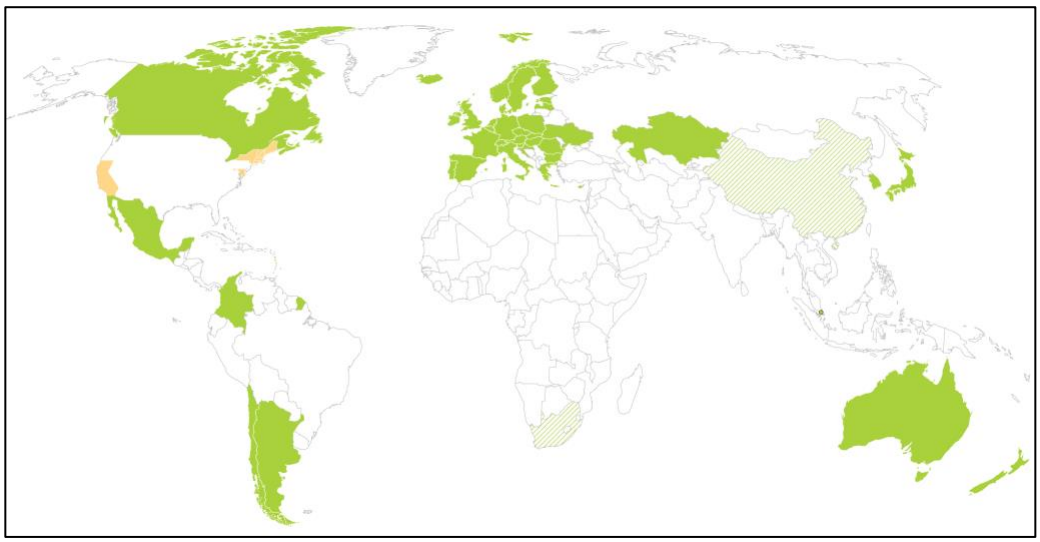

Figure 4: Geographic Regulatory Capture of Carbon Taxes [25]

[21] *"**Carbon Tax** is a tax levied on the carbon content of fuels, generally in the transport and energy sector. Carbon tax is actually an instrument intending to reduce carbon dioxide emissions by increasing the price of fossil fuels and decreasing the demand for them. Carbon taxes are a form of carbon pricing. The term carbon tax is also used to refer to a carbon dioxide equivalent tax, the latter of which is quite similar but can be placed on any type of greenhouse gas or combination of greenhouse gases, emitted by any economic sector."*
^ "Carbon Tax," Wikipedia (Wikimedia Foundation, October 7, 2020), https://en.wikipedia.org/wiki/Carbon_tax.

[22] "Carbon Pricing Dashboard: Up-to-Date Overview of Carbon Pricing Initiatives," Carbon Pricing Dashboard | Up-to-date overview of carbon pricing initiatives, 2020, https://carbonpricingdashboard.worldbank.org/.

[23] Sakai, Marco, and John Barrett. "Border Carbon Adjustments: Addressing Emissions Embodied in Trade." *Energy Policy* 92 (May 2016): 102–10. https://doi.org/10.1016/j.enpol.2016.01.038.

[24] "Trade and The Environment," accessed October 9, 2020, https://www.oecd.org/trade/topics/trade-and-the-environment/.

[25] Brad Plumer and Nadja Popovich, "These Countries Have Prices on Carbon. Are They Working?," The New York Times (The New York Times, April 2, 2019), https://www.nytimes.com/interactive/2019/04/02/climate/pricing-carbon-emissions.html.

The current solution to tax and account for these globally re-located emissions is to treat them as an Embedded Emission (EE). However, this is a controversial method as emissions are measured according to production, rather than consumption.[26] Therefore, this computation is biased because instead of the importing country, EEs on imported goods are attributed to the exporting country. This is inappropriate and unfair as the actual responsibility of such emissions must instead be realized by the consumer.[27]

Case-Study: China and United States of America

A comprehensive report[28] from Banque de France calculates carbon emissions with respect to global trade flows. It emphasises that, "national emissions do not provide an accurate picture of a country's actual carbon footprint since a portion of its output is exported, and a portion of its demand is satisfied by imports." They highlight that developed economies are net consumers of CO_2 while developing Nations are net exporters of CO_2, hence generating a global CO_2 trade surplus and deficit. This implies that developed Nations' total footprints exceed their effective emissions and developing Nations' footprints are hence smaller than their effective emissions.

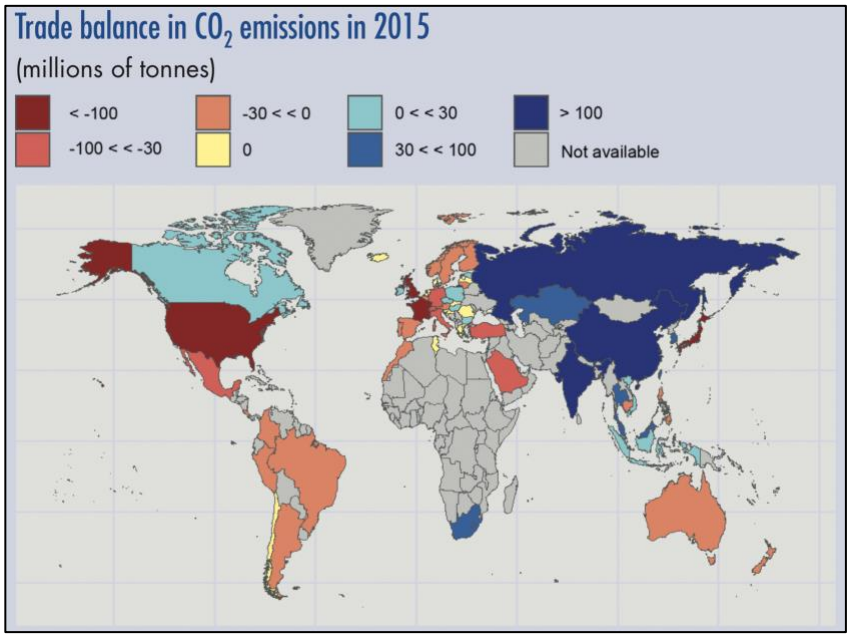

Figure 5: Global Carbon Trade Balance in 2015[29]

[26] "International Climate Change Negotiations," United Kingdom Parliament, 2010, https://publications.parliament.uk/pa/cm200910/cmselect/cmenvaud/uc446-i/uc44602.htm.

[27] "Embedded Emissions," Wikipedia (Wikimedia Foundation, January 28, 2020), https://en.wikipedia.org/wiki/Embedded_emissions.

[28] Trade Balance in CO2 Emissions in 2015. "CO2 Emissions Embodied in International Trade" (Banque de France, 2020), https://publications.banque-france.fr/sites/default/files/medias/documents/820083_bdf228-1_co2_en_v5.pdf.

[29] "CO2 Emissions Embodied in International Trade" (Banque de France, 2020), https://publications.banque-france.fr/sites/default/files/medias/documents/820083_bdf228-1_co2_en_v5.pdf.

In 2016, 19.23% of Chinese exports were to the United States (US)[30], making up 21.2%[31] of total US imports. In 2015, China, the largest global exporter of CO_2, "accounted for 24% of total trade-embodied emissions", while the US, the largest market, absorbed 15% of traded CO_2."[32] Essentially, China's total local emissions of 9.1 billion tonnes did not represent its actual carbon footprint, which was around 8 billion tonnes owing to a CO_2 trade surplus of 1.1 billion tonnes. Similarly, the US' CO_2 trade deficit was - 0.7 billion tonnes which, "needed to be added to its total domestic emissions of 5.1 billion tonnes in order to determine its actual footprint of 5.8 billion tonnes." [33]

[30] "China Trade Summary," WITS, 2018, https://wits.worldbank.org/CountryProfile/en/Country/CHN/Year/LTST/Summarytext.

[31] "The People's Republic of China," United States Trade Representative, 2018, https://ustr.gov/countries-regions/china-mongolia-taiwan/peoples-republic-china.

[32,33] Trade Balance in CO2 Emissions in 2015. "CO2 Emissions Embodied in International Trade" (Banque de France, 2020), https://publications.banque-france.fr/sites/default/files/medias/documents/820083_bdf228-1_co2_en_v5.pdf.

5.0 Societal Implications

5.1 Metabolic Rift Casting Shadows

"The wealthiest 1% of the world's population is responsible for the emission of more than twice as much carbon dioxide as the poorer half of the world."[34] As evident from the graph below, "comparing the average lifestyle consumption footprints of richer and poorer citizens in a range of countries helps show that while some 'emerging economies' like India and China have high and rapidly rising emissions, the lifestyle consumption emissions of even their richest citizens remain behind that of their counterparts in rich OECD countries."[35] Therefore, despite having lower populations than the developing world, per capita consumption and hence carbon footprints are exponentially higher in the developed world. Hence, instead of determining emissions at national scales, it would rather be logical to compare emissions with respect to total resident individuals in a Nation i.e. the ultimate consumers.

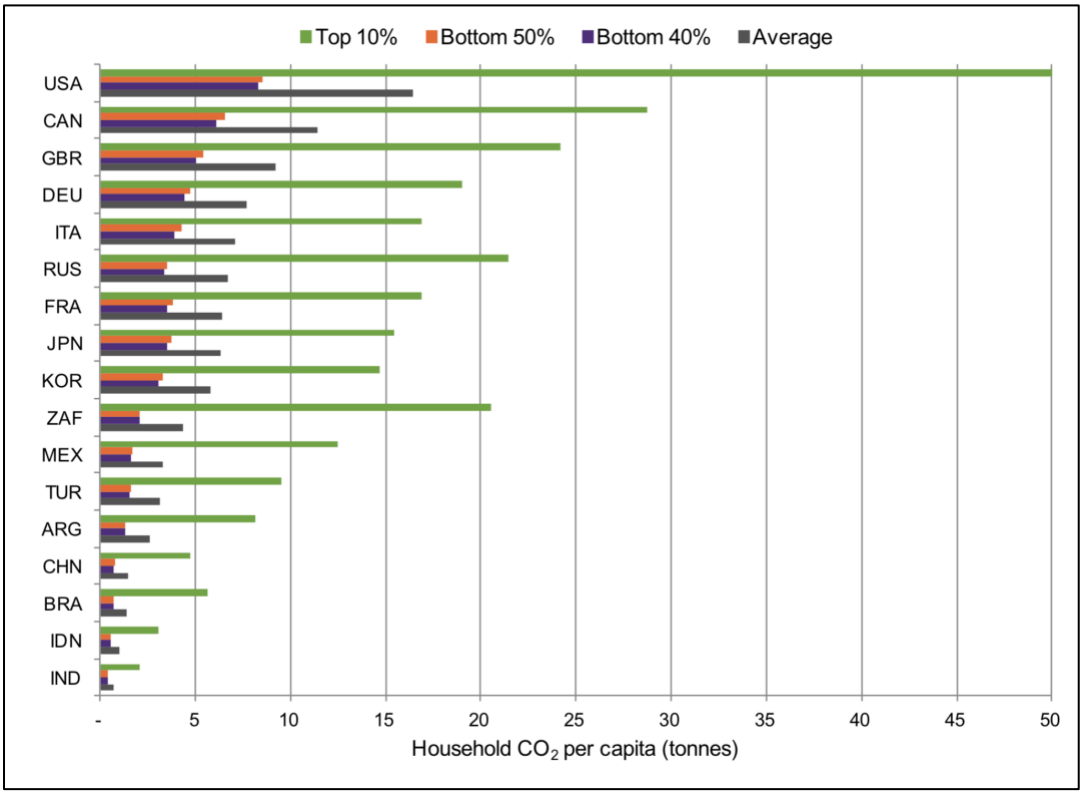

Figure 6: CO_2 Emissions Per Capita based on Financial Bracket[36]

[34] "World's Richest 1% Cause Double CO2 Emissions of Poorest 50%, Says Oxfam," The Guardian (Guardian News and Media, September 20, 2020), https://www.theguardian.com/environment/2020/sep/21/worlds-richest-1-cause-double-co2-emissions-of-poorest-50-says-oxfam?utm_term=Autofeed.

[35,36] "Extreme Carbon Inequality" (Oxfam, December 2, 2015), https://oi-files-d8-prod.s3.eu-west-2.amazonaws.com/s3fs-public/file_attachments/mb-extreme-carbon-inequality-021215-en.pdf.

While some extremely wealthy individuals live lives of excess (usage and wastage), it must be recognized that not all 'modernized' individuals can make radical changes to their lifestyles. This inability of individuals to act is a function of how deeply they are embedded in the socio-economic and socio-political nexus of society. There really is no 'consumer choice' per se, as the materialized society is a function of cumulative choices made by government and corporate actors, not individuals. The implication of this incapacity of individuals is captured thoroughly by the concept of Carbon Shifting.[37] For instance, even if the individual buys an electric vehicle to replace their combustion vehicle, they might be plugging into a grid powered by coal or potentially purchasing a blood battery[38] that had its cobalt mined unsustainably by a child in the Democratic Republic of Congo. Therefore, claims of ES within local boundaries are fictitious, as without fostering widespread systemic change across societies globally, achieving true ES is unlikely.

Marx's Metabolic Rift asserts that Capitalism has 'estranged' the bonds between man and nature by making both labour and nature its property. In doing so, individuals are alienated from others, society, and the products of their own labour. As evident in the graphic below, this has transformed the way society interacts with the nature i.e. it has shifted from a pre-modern symbiotic relationship to a modern rifted metabolism.[39]

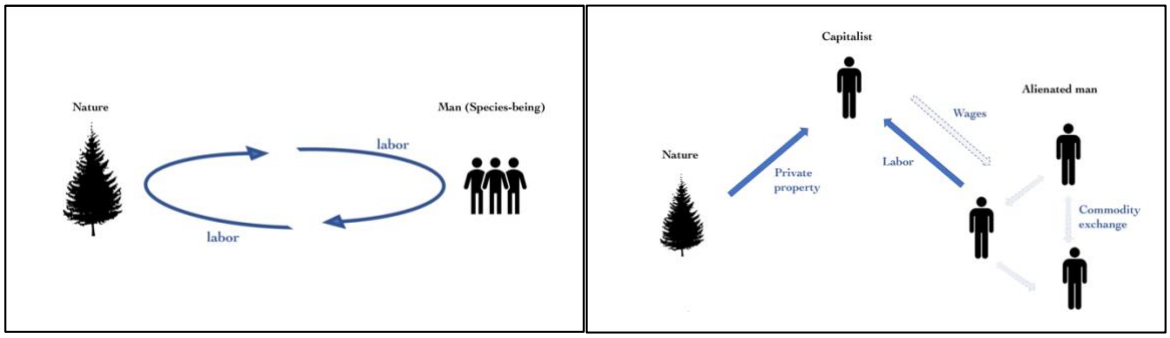

Figure 7: Pre-modern Versus Modern Nature-Human Relations[40]

Historically, as Capitalism matured it compelled people to densify in cities, and consequently sustained them through the establishment of resources supplies from distant societies, in turn 'casting shadows' on them. "The urban metabolism binds together the areas, even distant ones, that are the sources of goods and sinks for waste - along with the city itself. Grounding that recognition in the idea of metabolic rift, with its inherent critical dimension, should remind us

[37] *"**Carbon shifting** is the tendency for an individual to increase carbon dioxide emissions in one area of their lifestyle as a result of reducing emissions elsewhere."*
^"Carbon Shifting," October 3, 2019, https://en.wikipedia.org/wiki/Carbon_shifting.

[38] James Conca, "Blood Batteries - Cobalt And The Congo," Forbes (Forbes Magazine, September 26, 2018), https://www.forbes.com/sites/jamesconca/2018/09/26/blood-batteries-cobalt-and-the-congo/.

[39,40] *Marx Metabolic Rift Lecture*. Video, 2020. https://www.youtube.com/watch?v=tt-TCgmZWLA.

that the processes that support urban life can at the same time be responsible for inequity elsewhere."[41]

With that framing, I believe that we live in an age of the 'hyper-metabolic rift', wherein the world is rifting endlessly with the global intensification of Capitalism. Moore[42] presents, "world history since the late 15th century as succession of metabolic rifts, with each stage encompassing more of the planet as capitalist economies reach out beyond their current spatial boundaries." [43] With these successions, more distant territories have become integrated into the market system, e.g. Olives from Andalusia, Spain on sale in Manhattan, New York. In that sense, "virtually any city's metabolism is actually global in scale: it is part of a system that moves commodities, people and money across the planet." [44]

5.2 Revisiting Ecomodernism

The Ecomodernist proposal promotes rapid urbanization as a mechanism to foster ES by 'decoupling' from nature. Yet, it fails to recognize that this would only make the problem worse as the degree of metabolic rift tends to be more severe in the developed, import-dependent regions. Therefore, urbanization would increase the complexity of supply chains and subsequently raise the levels of consumption and emissions given the heightened metabolic rift of these newly urbanized populations, for instance, through privatised agricultural intensification.[45]

I believe that the merit of the Ecomodernist proposal arguably lies in its call to harness technology. However, it is important to recognize that their scheme of technological intensification to make extraction more efficient may only make us more susceptible to Jevon's Paradox[46]. Rather, in sync with regulation, technology should be used curtail over-consumption by accurately monitoring and accounting for 'full-stream' emissions in order to facilitate the undistorted imposition of duties and equitable re-allocation of resources.

[41,43,44] Zev Trachtenberg, "'Environmental Crises and the Metabolic Rift in World-Historical Perspective,'" March 14, 2018, https://inhabitingtheanthropocene.com/2018/02/28/environmental-crises-and-the-metabolic-rift-in-world-historical-perspective/.

[42] Moore, Jason W. "Environmental Crises and the Metabolic Rift in World-Historical Perspective." *Organization & Environment* 13, no. 2 (June 2000): 123–57. https://doi.org/10.1177/1086026600132001.

[45] *"This hope appears to be informed by a crashing misconception. The ecomodernists talk of "unproductive, small-scale farming" and claim that "urbanisation and agricultural intensification go hand in hand." In other words, they appear to believe that smallholders, working the land in large numbers, produce lower yields than large farms. But since Amartya Sen's ground-breaking work in 1962, hundreds of papers in the academic literature demonstrate the opposite: that there is an inverse relationship between the size of farms and the crops they produce. The smaller they are, on average, the greater the yield per hectare."*
^ George Monbiot, "Meet the Ecomodernists: Ignorant of History and Paradoxically Old-Fashioned," The Guardian (Guardian News and Media, September 24, 2015), https://www.theguardian.com/environment/georgemonbiot/2015/sep/24/meet-the-ecomodernists-ignorant-of-history-and-paradoxically-old-fashioned.

[46] "***Jevons Paradox*** *occurs when technological progress or government policy increases the efficiency with which a resource is used (reducing the amount necessary for any one use), but the rate of consumption of that resource rises due to increasing demand."*
^ "Jevons Paradox," July 24, 2020, https://en.wikipedia.org/wiki/Jevons_paradox.

6.0 Reconceptualization and Recalculation

Occasionally, the National scaling of ES metrics may certainly be useful to determine domestic consumption inefficiencies, refine ES policy, or strategize for ES deliverables. However, such metrics need to be re-designed and re-scaled to take into account today's skewed and dynamic patterns of global consumption. Further research must focus on re-establishing localized supply chains, determining methods of equitable carbon accounting, and devising global environmental governance frameworks[47]. Moreover, these research agendas must integrate newly emerging concepts of Reverse Supply Chains[48] and Regenerative Sustainability[49] in order to enable 'development' that is more equitable for both humans and the planet.

More broadly, the natural and societal impacts of Capitalism need to be considered consciously to re-evaluate what true 'development' actually means and entails. In doing so, humankind must challenge the constructs of modernity and recognize its inherent hostility towards nature. We must learn to be a part of Nature, not apart from it.[50] Afterall, for the sustenance of human life we may need a re-indigenization to live harmonious lives of subsistence.

[47] *For instance, "the inclusion of environmental provisions in trade agreements has also helped harmonise environmental regulations between developed and developing countries. More advanced economies can provide resources and institutions for capacity building and can encourage less-developed partners to strengthen environmental regulations. The OECD has addressed many issues on trade and environment such as environment and regional trade agreements (RTAs) the drivers of environmental provisions in RTAs, as well as the stringency of environmental policies as a driver for trade in goods in environmental goods and services.*
^ "Trade and the Environment," OECD, accessed October 9, 2020, https://www.oecd.org/trade/topics/trade-and-the-environment/.

[48] "***Reverse Supply Chains*** *have been proposed in response to the increasing quantity of consumer-discarded products, RSCs promote remanufacturing, which is a process that returns a used product to a new state through the refurbishment, replacement, and reuse of its components."*
^ Alkhayyal, Bandar A. "Designing an Optimization Carbon Cost Network in a Reverse Supply Chain." *Production & Manufacturing Research* 7, no. 1 (January 1, 2019): 271–93. https://doi.org/10.1080/21693277.2019.1619103.

[49] *"**Regenerative Sustainability** is emerging as an alternative discourse around the transition from a 'mechanistic' to an 'ecological' or living systems worldview. This view helps us to re-conceptualize relationships among humans' technological, ecological, economic, social and political systems."*
^ Zhang, Xiaoling, Martin Skitmore, Martin De Jong, Donald Huisingh, and Matthew Gray. "Regenerative Sustainability for the Built Environment – from Vision to Reality: An Introductory Chapter." *Journal of Cleaner Production* 109 (December 2015): 1–10. https://doi.org/10.1016/j.jclepro.2015.10.001.

[50] David Attenborough, "David Attenborough: A Life on Our Planet," October 4, 2020, https://www.netflix.com/title/80216393.

7.0 Bibliography

"2020 Results Overview: Environmental Performance Index," EPI, 2020, https://epi.yale.edu/epi-results/2020/component/epi.

"Carbon Pricing Dashboard: Up-to-Date Overview of Carbon Pricing Initiatives," Carbon Pricing Dashboard | Up-to-date overview of carbon pricing initiatives, 2020, https://carbonpricingdashboard.worldbank.org/.

"Carbon Shifting," October 3, 2019, https://en.wikipedia.org/wiki/Carbon_shifting.

"Carbon Tax," Wikipedia (Wikimedia Foundation, October 7, 2020), https://en.wikipedia.org/wiki/Carbon_tax.

"China Trade Summary," WITS, 2018, https://wits.worldbank.org/CountryProfile/en/Country/CHN/Year/LTST/Summarytext.

"CO2 Emissions Embodied in International Trade" (Banque de France, 2020), https://publications.banque-france.fr/sites/default/files/medias/documents/820083_bdf228-1_co2_en_v5.pdf.

David Attenborough, "David Attenborough: A Life on Our Planet," October 4, 2020, https://www.netflix.com/title/80216393.

"Ecomodernism," Wikipedia (Wikimedia Foundation, September 22, 2020), https://en.wikipedia.org/wiki/Ecomodernism.

"Embedded Emissions," Wikipedia (Wikimedia Foundation, January 28, 2020), https://en.wikipedia.org/wiki/Embedded_emissions.

"Energy – Facts and Figures," eda.admin.ch, 2019, https://www.eda.admin.ch/aboutswitzerland/en/home/wirtschaft/energie/energie---fakten-und-zahlen.html.

"Extreme Carbon Inequality "(Oxfam, December 2, 2015), https://oi-files-d8-prod.s3.eu-west-2.amazonaws.com/s3fs-public/file_attachments/mb-extreme-carbon-inequality-021215-en.pdf.

"International Climate Change Negotiations ," United Kingdom Parliament , 2010, https://publications.parliament.uk/pa/cm200910/cmselect/cmenvaud/uc446-i/uc44602.htm.

"Life-Cycle Assessment," Wikipedia (Wikimedia Foundation, August 30, 2020), https://en.wikipedia.org/wiki/Life-cycle_assessment.

"Petroleum Industry in Nigeria," Wikipedia (Wikimedia Foundation, September 29, 2020), https://en.wikipedia.org/wiki/Petroleum_industry_in_Nigeria.

"The People's Republic of China," United States Trade Representative, 2018, https://ustr.gov/countries-regions/china-mongolia-taiwan/peoples-republic-china.

"Trade and The Environment," accessed October 9, 2020, https://www.oecd.org/trade/topics/trade-and-the-environment/.

"Trade and the Environment," OECD, accessed October 9, 2020, https://www.oecd.org/trade/topics/trade-and-the-environment/.

"Where It All Begins: Refining: VARO," VARO Energy, 2018, https://varoenergy.com/en/what-we-do/refining.

"World's Richest 1% Cause Double CO2 Emissions of Poorest 50%, Says Oxfam," The Guardian (Guardian News and Media, September 20, 2020), https://www.theguardian.com/environment/2020/sep/21/worlds-richest-1-cause-double-co2-emissions-of-poorest-50-says-oxfam?utm_term=Autofeed.

Alkhayyal, Bandar A. "Designing an Optimization Carbon Cost Network in a Reverse Supply Chain." *Production & Manufacturing Research* 7, no. 1 (January 1, 2019): 271–93. https://doi.org/10.1080/21693277.2019.1619103.

Brad Plumer and Nadja Popovich, "These Countries Have Prices on Carbon. Are They Working?," The New York Times (The New York Times, April 2, 2019), https://www.nytimes.com/interactive/2019/04/02/climate/pricing-carbon-emissions.html.

Castleman, Barry I. "The Export of Hazardous Factories to Developing Nations." *International Journal of Health Services* 9, no. 4 (October 1979): 569–606. https://doi.org/10.2190/Y298-HVAP-L3U2-JMF4.

Collard, Rosemary-Claire, Jessica Dempsey, and Juanita Sundberg. "The Moderns' Amnesia in Two Registers." *Environmental Humanities* 7, no. 1 (2015): 227–32. https://doi.org/10.1215/22011919-3616425.

George Monbiot, "Meet the Ecomodernists: Ignorant of History and Paradoxically Old-Fashioned," The Guardian (Guardian News and Media, September 24, 2015), https://www.theguardian.com/environment/georgemonbiot/2015/sep/24/meet-the-ecomodernists-ignorant-of-history-and-paradoxically-old-fashioned.

Ite, Aniefiok E., Udo J. Ibok, Margaret U. Ite, and Sunday W. Petters. "Petroleum Exploration and Production: Past and Present Environmental Issues in the Nigeria's Niger Delta." *American Journal of Environmental Protection* 1, no. 4 (2013): 78-90.

James Conca, "Blood Batteries - Cobalt And The Congo," Forbes (Forbes Magazine, September 26, 2018), https://www.forbes.com/sites/jamesconca/2018/09/26/blood-batteries-cobalt-and-the-congo/.

"Jevons Paradox," July 24, 2020, https://en.wikipedia.org/wiki/Jevons_paradox.

John E Asafu-Adjaye et. al, "An Ecomodernist Manifesto," An Ecomodernist Manifesto, 2015, http://www.ecomodernism.org/.

Marx Metabolic Rift Lecture. Video, 2020. https://www.youtube.com/watch?v=tt-TCgmZWLA.

Moore, Jason W. "Environmental Crises and the Metabolic Rift in World-Historical Perspective." *Organization & Environment* 13, no. 2 (June 2000): 123–57. https://doi.org/10.1177/1086026600132001.

R. Andreas Kraemer, Sascha Müller-Kraenner, and David Campbell, "Review of the Environmental Performance Index (EPI)," Review of the Environmental Performance Index (EPI) | Ecologic Institute: Science and Policy for a Sustainable World (Yale University, School Forestry & Environmental Studies, United States and Robert Bosch Foundation, Germany, October 1, 2005), https://www.ecologic.eu/1711.

Rahman, Md. Mustafizur, Christina Canter, and Amit Kumar. "Well-to-Wheel Life-Cycle Assessment of Transportation Fuels Derived from Different North American Conventional Crudes." *Applied Energy* 156 (October 2015): 159–73. https://doi.org/10.1016/j.apenergy.2015.07.004.

Sakai, Marco, and John Barrett. "Border Carbon Adjustments: Addressing Emissions Embodied in Trade." *Energy Policy* 92 (May 2016): 102–10. https://doi.org/10.1016/j.enpol.2016.01.038.

Swissinfo.ch, “Tamoil Refinery to Stop Work in Switzerland,” SWI swissinfo.ch (swissinfo.ch, November 9, 2017), https://www.swissinfo.ch/eng/business/crude-closure-_tamoil-refinery-to-stop-work-in-switzerland/41214558.

Tejvan Pettinger et al., “Environmental Kuznets Curve,” November 18, 2019, https://www.economicshelp.org/blog/14337/environment/environmental-kuznets-curve/.

The relationship between 2020 EPI Score and GDP per capita, “Environmental Performance Index,” EPI (Yale Center for Environmental Law & Policy, 2002), https://epi.yale.edu/.

Trade Balance in CO2 Emissions in 2015. “CO2 Emissions Embodied in International Trade” (Banque de France, 2020), https://publications.banque-france.fr/sites/default/files/medias/documents/820083_bdf228-1_co2_en_v5.pdf.

Wood Mackenzie, “Energy Research & Consultancy,” September 12, 2019, https://www.woodmac.com/reports/refining-and-oil-products-switzerland-downstream-oil-long-term-outlook-43685730.

Zev Trachtenberg, “‘Environmental Crises and the Metabolic Rift in World-Historical Perspective,’” March 14, 2018, https://inhabitingtheanthropocene.com/2018/02/28/environmental-crises-and-the-metabolic-rift-in-world-historical-perspective/.

Zhang, Xiaoling, Martin Skitmore, Martin De Jong, Donald Huisingh, and Matthew Gray. “Regenerative Sustainability for the Built Environment – from Vision to Reality: An Introductory Chapter.” *Journal of Cleaner Production* 109 (December 2015): 1–10. https://doi.org/10.1016/j.jclepro.2015.10.001.