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Extractivism & Associated Responses

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Jeffrey Lippincott April 15, 2021

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Abstract- This piece examines current extractivist actions and their associated social and environmental costs. While analyzing concurrent economic practices and their relationship to global climate change. It then looks specifically at wind, solar and hydroelectric energy to examine the true costs of each and outline key areas of concern as we transition into this new epoch.

On May 11, 2020 the Pipeline and Hazardous Materials Safety Administration (PHMSA) decided to shoot down a Washington state effort to regulate trains carrying volatile oil within its borders; proclaiming that a state cannot use “safety as a pretext for inhibiting market growth,” - Paul J. Roberti, chief counsel for PHMSA.¹ This statement has vast spatial and social implications. These ‘bomb trains,’ as they have become known, have on multiple occasions derailed, ignited and endangered countless citizens due to poor oversight and deregulation. And if human lives are not a viable pretext for stepping up safety measures because it would inhibit market growth, that might only suggest profits are necessary and humans are expendable. For anyone to come to this psychopathic conclusion one must be so far removed from empathy, with a one dimensional and extremely narrow interpretation of value, in this case that is profit. This is a perfect summation of a core issue of climate change not merely *because* it is defending oil but more so *why* it is defending oil.

As I’ve come to understand it, the current climate catastrophe is only partly about the actual climate. It is a much more nuanced and complex issue than some solar panels and wind turbines will solve. To start mitigating our human generated skyrocket of global temperatures we would need to fix some deep rooted affiliations with economic growth, our lackluster effort to create a moderate livable standard for us all, and our voracious appetite for fossil fuels. That would be a start, however many more fundamental changes would be necessary to sustain and maintain this approach.

When I first started to look at this issue I didn’t expect to find such intense despair, trauma, malfeasance, abuse, and death. I knew it was a drastic issue but not really at the level I believe it to be now. Naomi Klien makes an interesting point in her book *This Changes Everything*: “Ours is a culture of disavowal, of simultaneously knowing and not knowing- the illusion of proximity coupled with the reality of distance is the trick perfected by the

¹ Justin Mikulka, “Safety Can’t Be a ‘Pretext’ for Regulating Unsafe Oil Trains, Says Trump Admin.” Desomg. March 20,2020

fossil-fueled global market.”² This is made all the more drastically disastrous given the intensifying globalization of current political and economic operations in the decades following WWII. The reality of distance is bearing an even greater overflow of resource consumption and exportation at the cost of human lives, planetary sustainability and ethics, while the illusion of proximity is hard at work fostering a sanitary sphere in which away land is comfortably out of sight and thus out of mind. All of which enables the cognitive operational impunity of the consumerist actions we take. But as we’ll see, this mind state was developed and learned and is not biologically impulsive, suggesting that it can be unlearned.

Environmentalism, the Free Market and Carbon Trading

Beginning in the late 1960’s and early 1970’s there was a growing environmental consciousness. Helped along by Rachel Carson’s publication ‘Silent Spring,’ which addressed the environmental impacts of pesticide use with a concerted attack on DDT, along with more environmental disasters like the 1969 Santa Barbara oil spill, plus a growing hippie movement, the 1970 saw the first celebrated Earth Day while many new environmentally concerned agencies began popping up. Moreover, the Environmental Defense Fund (EDF) was introduced in 1967, Friends of the Earth in 1969, and Greenpeace and EarthJustice in 1971, as well as the Environmental Protection Agency (EPA) in 1970. Aside from a growing concern and protective collaborations there were genuine legal actions being taken: the U.S alone in the 1970’s passed 23 federal environmental acts into law, some of which include the revised Clean Air Act, the Clean Water Act, and the Endangered Species Act. There seemed to be direct action and a flat out ban approach to environmental protection that included both organization of the masses and legal action taken in the courts, as seen with a growing public concern from Rachel Carson’s publication and the EDF’s original filing of the lawsuit that led to the ban on DDT. But as environmentalism became more legally astute it inevitably became more politicized.³

Enter the Reagan administration. Reagan and his posse had quite a different outlook on conservation, that saw it more in the light of a nefarious plot to seize political and economic control. This is perhaps best summed up by his interior secretary James Watt when he describes environmental fears “as a tool to achieve a greater objective [of] centralized planning and control

² Naomi Klein, *This Changes Everything : Capitalism vs. the Climate*. (New York: Simon & Schuster Paperbacks) 168

³ Klein., 201-203

of the society.”⁴ He goes on to draw a line between control and the Nazi party, essentially insinuating a comparison between environmentalism and Nazism. Another key note occurring in the 1980’s is the intensified and billowing free market ideology that put an exponential and continuous economic growth model above all else. This had a cataclysmic effect on environmental groups who had become accustomed to finances and access provided through philanthropy and began a pro-business approach to conservation.

New more market cooperative groups like the Conservation Fund and Conservation International were attracting the big donors resulting in established groups like the Nature Conservancy to fall in line with a free market mentality and loosen their definition of environmentalism (and in the case of the Nature Conservancy actually begin drilling for gas themselves in 1999 and then for oil in 2007, on land they were suppose to use to protect the Attwater Prairie Chicken which became extinct in 2012).⁵ And in one of the biggest contradictions of all, the EDF (who previously championed the ban on DDT) under the guise of the new ideologue Fred Krupp, would now use its power to partner up with polluters and introduce them to new cost savings and green markets. Klein states that “it was this transformation, more than any other, that produced a mainstream climate movement that ultimately found it entirely appropriate to have coal and oil companies sponsor their most important summits while investing their own wealth with these same players.” Even worse yet was the decimation of the Kyoto Protocol by Al Gore, taking its form in the shape of the carbon trading market.

The Kyoto Protocol was supposed to hold the largest emitting countries responsible for their share in global emissions and curb those emissions while sustaining a decline, thus not putting the lion’s share of the burden on the countries that least contributed to the cause. But the U.S. had other plans. Aside from succeeding to alter plans designed to reduce greenhouse gas emissions down 10% by 2010 to 5.2% by 2012, there was a darker storm brewing. George Monbiot published an article in *The Guardian* in 2007 stating, “Most of the other governments insisted that the cuts be made at home. But Gore demanded a series of loopholes big enough to drive a Hummer through. The rich nations, he said, should be allowed to buy their cuts from

⁴ Klein., 204

⁵ Klein., 191-195

other countries. When he won, the protocol created an exuberant global market in fake emissions cuts.”⁶ Klein further describes it:

“the scheme would issue pollution permits, which they [industries] could use or sell if they didn’t need them, or purchase so that they could pollute more. National programs would be set up so that companies could similarly trade these permits, with the country staying within an overall emissions cap. Meanwhile, projects that were employing practices that claimed to be keeping carbon out of the atmosphere- whether by planting trees that sequester carbon, or by producing low carbon energy, or by upgrading a dirty factory to lower its emissions- could qualify for carbon credits. These credits could be purchased by polluters and used to offset their own emissions.”⁷

In short, this carbon trading policy allows pollution to occur at the same rate but allows the same pollution to magically disappear because X amount of carbon is sequestered somewhere else, which are then sold off as credits, thus lining certain pockets with cash while disregarding actual emission cuts. This is made all the more suspicious when considering Al Gore’s position of privilege in promoting carbon trading. In 2004 Al Gore and David Blood began the management firm Generation Investment Management that directly benefits from carbon trading and offset projects alike. Generation IM alone has \$25.7 billion under investment as of September 2020, and 30.7 billion as of December 2020 with a net gain of 5 billion in 3 months⁸, and with at least 39 subsequent Generation IM firms operating in a slew of tax havens,⁹ it’s hard to believe that this is just about emission reductions. David Blood himself told *Financial Times* in 2004 that this approach “is primarily about delivering superior returns to clients.”¹⁰ So aside from the seemingly corrupt nature of carbon trading, it’s completely failed to remotely combat the very thing it set out to reduce.

The failure of the cap and trade system became clear in just this past decade when 130 environmental and economic justice groups called for the dissolution of the EU’s Emissions Trading System (ETS) the largest carbon trading system in the world. Ultimately, their

⁶ George Monbiot. “Hurray! We’re Going Backwards!” *The Guardian*. December 17, 2007.

⁷ Klein., 218

⁸ “Firm Overview | Generation Investment Management LLP.” n.d. www.generationim.com.

⁹ Chris Lang 2020. “Planet of the Humans (Part 1): Blood and Gore | REDD-Monitor.” Redd-Monitor.org. April 29, 2020.

¹⁰ *Financial Times*. 2004. “FINANCIAL TIMES Blood and Gore Launch Firm with a Difference,” November 8, 2004.

indictment of the EU's attempt to utilize cap and trade to reduce carbon emissions could not be more scathing:

“The ETS has not reduced greenhouse gas emissions... the worst polluters have had little to no obligation to cut emissions at source. Indeed, offset projects have resulted in an *increase* of emissions worldwide: even conservative sources estimate that between $\frac{1}{3}$ and $\frac{2}{3}$ of carbon credits bought into the ETS do not represent real carbon reductions.”¹¹

And, unfortunately, the damage is qualitatively more pronounced in the global south, which the program was supposed to benefit. For many of these offset projects end up disproportionately affecting these regions' most marginalized groups, leaving a trail of humanitarian and social abuses in their wake. Journalist Rosie Wong published an article in 2012 revealing how in Bajo Aguán, Honduras the CDM's influence has promoted injustice and violence to local inhabitants. Small farmers in this region have increasingly been absorbed by large landowners through approval of the Law of Agricultural Modernization, passed in 1994 under pressure from international financial institutions (particularly the IMF and World Bank). This deregulatory law allowed larger players to extend their territory beyond maximum legal property limits by buying up more land from smaller farmers. One such person is Miguel Facussé. Dinant, Facussé's Palm Oil company, has for years pumped its waste into large open pits that produce mass amounts of methane. But, under the CDM approved carbon offsetting program it can now be issued carbon credits for collecting this gas. These credits can then be sold to other polluters so they can keep pumping out emissions elsewhere worry free.

This doesn't work for a lot of reasons, not the least of which is that it is promoting economic growth in an industry that is causing deforestation and producing methane. On top of this Miguel Facusse himself has been accused of multiple human rights abuses bearing responsibility for the murder of numerous farmers in Bajo Aguán since the 2009 coup. All while the CDM approval is endorsing a 13,300 acre¹² palm oil for export model in a country where one in four children suffers chronic malnutrition, suggesting food for local use might be a better alternative use of the land.¹³ This is only one example: in Paraná, Brazil a project providing offsets for Chevron, GM, and American Electric Power and administered by the Nature

¹¹ Klein., 225

¹² “Dinant - Lo Mejor Para Tí.” n.d. Dinant.com.

¹³ Rosie Wong, 2015. “Carbon Blood Money in Honduras.” *The Violence of Development*. January 3, 2015.

Conservancy and a Brazilian NGO, has banned Indigenous Guarani people from foraging for wood, hunting, or fishing on their traditional land. Guaraquecaba locals have reported being shot at in the same offset project.¹⁴ Also, Pakistan's Billion Tree Tsunami Afforestation Project (BTTAP), ostensibly designed to be a 'triple win for climate, nature and jobs' has resulted in as much as \$3 million dollars siphoned off in corruption schemes on top of marginalization, displacement, and an overall decline of living standards for communities in the Khyber Pakhtunkhwa region.¹⁵

Extraction- Costs and Reactions

Despite the litany of adverse consequences of these programs, they are, at least, ostensibly carried out in the name of preservation. Yet, it has become apparent that the extraction projects themselves are far worse: decimating the land, sky rocketing emissions, producing substantial amounts of pollution- all creating life threatening public health issues. In Bajo Aguán alone, due to a multimillion-dollar loan from the International Financial Corporation (IFC, a branch of the World Bank that provides loans to private business) to Dinant, there has been a drastic increase in authoritarian violence against locals. Over 100 farmers have been killed in the Bajo Aguán region since November 2009, when the IFC disbursed the first half of a \$30 million loan to Dinant, and these killings have continued unabated despite their exposure by investigators and journalists.¹⁶ In Myanmar, the construction of a pipeline funded by Total (France) and Unocal (U.S. bought by Chevron in 2005) and Myanmar's state owned MOGE, to export natural gas from the Andaman Sea to neighboring Thailand, resulted in forced labor, displacement, land confiscation, rape, torture, and extrajudicial killings.¹⁷ In Pungesti, Romania, where Chevron aspires to christen the country with its first shale gas exploration well, local villagers, in fear of their pastoral traditions being eradicated through contaminated groundwater, staged a protest camp to try and prevent the drilling. This was met with an overwhelming use of force by riot police wielding batons and shields who proceeded to beat the villagers bloody.¹⁸ This is the new norm in environmental protection- a militarized response to poor and unalarming locals who are merely trying to protect their traditional land in order to be able to use it, not only

¹⁴ Klein., 221-222

¹⁵ Chris Lang, 2020. "Pakistan Offset Project | REDD-Monitor." Redd-Monitor.org. September 17, 2020.

¹⁶ "Juana Doe et Al. V. IFC." n.d. EarthRights International. Accessed January 22, 2021.

¹⁷Smith, Matthew. 2007. "Environmental Militarism." *Greener Management International* 2007 (52): 47+.

¹⁸ Klein., 298.

for future agricultural production, but simply to live a healthy toxic-free life, and carry out their cultural practices in peace.

These scenarios are a serious cause for alarm in light of the current state of the fossil fuel industry. Klein astutely points out that with “a combination of high commodity prices, new technologies, and depleted conventional reserves, the industry [fossil fuel] is going further on every front. It is extracting more, pushing into more territory, and relying on more risky methods.”¹⁹ Nowhere is this more apparent than the ravenous appetite for natural gas through hydraulic fracturing. And with America having ‘two Saudia Arabias of oil’ in the form of proven natural gas reserves, one could expect to see heightened military measures in response to fabricated domestic terrorism. Josh Fox shares a recording in his documentary *Gasland 2*, of a Texas Oil and Gas Industry conference in which the head speaker for Range Resources, Matt Pitzarella, is touting his team's use of psychological operations (PSYOPS) against landowners in Texas. Perhaps equally as disdainful, Matt Charmichael of Anadarko Petroleum Corporation was discovered to be advising his Public Relation representatives to go download the U.S Army/Marine Corps Counterinsurgency Manual and take the course provided by Harvard and MIT called ‘Dealing with an Angry Public.’

None of this mentions the vast amounts of methane leaked during natural gas extraction, the groundwater contamination and soil depletion fracking produces, which has all resulted in the decline of property values, land use and drastic public health and safety issues. So, as the local folk who are bearing the brunt of the consequences due to these sites try to protect themselves, their families, and their land from the toxins of fracking, they are being labeled as eco-terrorists and treated as such. One such example involves a protester named Alex (a pseudonym) who in response to Mountain Valley Pipeline LLC project that would span the Virginias- leaking natural gas across the transit states and decimating local ecology and habitats- chained himself to cement filled tires that were physically inside a section of the pipeline in West Virginia. Only after being dragged out of the pipe feet first by a rope were they then charged with two felonies and an act of terrorism.²⁰

Despite the appalling nature of these anecdotes, there are even more authoritarian and militaristic measures accompanying these extractive projects with an equally alarming response

¹⁹ Klein., 310.

²⁰ King, Elizabeth. 2019. “THE NEW GREEN SCARE: Lawmakers Are Ramping up Penalties for Protesters Who Take the Kind of Drastic Action Needed to Save the Planet.” *The Progressive*, 19+.

to any push back, all of which are increasing violence, poverty, and ultimately emissions. This is a very small set of examples that Christian Parenti outlines in detail in his book *Tropic of Chaos*. As an investigative journalist he explores what he calls the catastrophic convergence, the “collision of political, economic, and environmental disasters.” He went on to further describe this phenomenon in greater detail:

“In the case of climate change, the prior traumas that set the stage for bad adaptation, the destructive social response, are Cold War-era militarism and the economic pathologies of neoliberal capitalism. Over the last forty years, both these forces have distorted the state’s relationship to society- removing and undermining the state’s collective regulatory, and redistributive function, while overdeveloping its repressive and military capacity. This, I [Parenti] argue, inhibits society’s ability to avoid violent dislocations as climate change kicks in.”²¹

This is an extremely alarming realization given that a 2008 report from the International Migration Organization estimates that between 25 million and 1 billion people will be displaced by 2050, with 200 million being the accepted figure.²² That is obviously a tentative number since altered climate patterns are extremely unpredictable; nevertheless, it will undoubtedly result in terrifyingly caustic border security, heightened xenophobia and nationalism, and an equally unprecedented amount of weapons and people who are ready to use them. One need not look much further than the U.S Mexico border for an, unfortunately, perfect example.

Not only are these extractive practices socially crippling, but the economic model on which they are based seems to be ecologically suicidal. For fossil fuel companies to operate economically they have to prove to shareholders that they have future carbon deposits on the books for extraction. So, as they use up what is in their reserves they can show a steady (if not overwhelming) flow of hydrocarbons coming in, thus proving to the shareholders that their investment is not in vain and will yield them profits for the foreseeable future. This is called a ‘reserve-replacement ratio,’ and it is the cornerstone on which fossil fuel extraction companies exist. Unfortunately for the planet that means these companies have a fiduciary responsibility to the forces of the market to find carbon deposits wherever they can. This is made even more

²¹ Christian Parenti 2012. *Tropic of Chaos : Climate Change and the New Geography of Violence*. (New York: Nation Books) 7-8

²² Oli Brown. 2008. “Migration and Climate Change.” *ResearchGate*. International Organization for Migration.

poignant when one considers that fossil fuels are a finite resource. Many have posited that this will ultimately inspire innovation away from current practices, seeing as how ancient carbon deposits are not a recurring phenomenon and extended extraction will inevitably result in one outcome- no more carbon deposits. So aside from the now thorough research into the planetary effects of fossil fuel extraction, from a fiduciary standpoint, if you're looking to make unabated perpetual profits, why put a ton of your eggs into one finite resource basket? This perfectly exemplifies just how myopic the current model is for these companies, as their commitment to quarterly revenue growth will ultimately be detrimental to the long-term viability of these companies; thus, it appears that the damage left in their wake is not actually contributing to their future survival.

Because these companies are forced to ramp up their replacement ratios every year, no destination is too far to prospect or extract in the name of profit. This obviously runs counter-productive to staying below a global temperature of 2°C. It has been recorded that if we'd like to remain below the 2°C limit, between 2011 and 2049 we are allotted 565 gigatons of carbon to burn. That is highly concerning given that the reserves claimed by all the fossil fuel companies, ones that are currently making money for shareholders, rests at 2,795 gigatons of carbon.²³ (A gigaton is equal to 400,000 olympic sized swimming pools.²⁴) It should also be cause for alarm that our fossil fuel extraction methods are becoming ever more unconventional.

With a conventional well, the extraction team drills down and pumps up; when that is not an option, they will drill down, sideways and across, blasting through the ground underneath and collecting the resulting debris. It is one thing that these unconventional methods are much more physically destructive to the ground, but it is another thing entirely when considering the process by which these extreme extraction operations function. For instance, to release the bitumen (the semi solid petroleum product used for asphalt) from tar sands when open pit mining is not an option, steam extraction is necessary. This occurs by drilling two wells, one to inject steam (in which the water is often superheated by fracked natural gas) to loosen the tar sands deposits and make the bitumen flow more easily as the second well pumps the concoction to the surface, where it rests in huge open pools to be collected.²⁵

²³ Klein., 148.

²⁴ Paul Hawkin 2017. *Drawdown : The Most Comprehensive Plan Ever Proposed to Reverse Global Warming*. (New York, New York: Penguin Books) xiv.

²⁵ Andrew Prince, 2012. "NPR Choice Page." Npr.org. August 16, 2012.

This is known as Enhanced Oil Recovery (EOR), and is being increasingly used to squeeze every last drop out of an oil reserve as possible. Although more commonly, wells are injected with CO₂ and “research shows that this use of CO₂ could cause the U.S proven oil reserves to double or even, with ‘next-generation’ technologies, quadruple.”²⁶ Even worse yet, EOR is estimated to be almost 3 times as green-house gas intensive as conventional extraction, and the biggest bane to EOR is the lack of available and affordable CO₂.

This has spurred an unhealthy concern to fabricate carbon capturing machines for all the wrong reasons. The president of Kilimanjaro Energy, Ned David, is one such person and one of eleven finalists for Richard Branson’s ‘Virgin Earth Challenge’ (a since ceased competition that would have awarded the first person to sequester one billion tons of carbon a year from the air a 25-million-dollar prize). He claims that “machines like his have the potential to release huge volumes of oil once assumed untappable. He told *Fortune Magazine*, “The prize is nearly 100 billion barrels of U.S oil if you can economically capture CO₂ from air. That’s 10\$ trillion dollars of oil.”²⁷ That’s like trying to sew up an open wound with a butchers knife; it will undoubtedly just make things worse.

Progression Steps

But if we assume that for every action there is an equal and opposite reaction, one might expect this to apply comparatively to our social world. As a state of fear, xenophobia, nationalism, discrimination, dominance and hatred has become the hardened ideological norm for the seemingly global National Security State, it is now being matched by the activism, unity, interdependence, advice and good will of those who try to stand up for the oppressed. The advances in communication that have come to define our era have made exposure unavoidable and information easily shared, begetting assistance and aid where discrimination, displacement, and injustice are rampant.

This is enhancing the power of environmental action and diversifying climate combatants alike. Frontline communities, local and student activists, First Nation Tribes, farmers and ranchers, lawyers, journalist, artists and more, combined with growing divestment strategies are bringing disparate elements of the same fight together and changing the social license and operational impunity with which these companies and organizations have been operating with in

²⁶ Klein., 247

²⁷ Klein., 247

years past. Perhaps the most powerful agent available to combat these corrosive climate projects is to merely honor the legal precedence already established under Indigenous land treaties and observe the legitimate rights accorded to them. These treaties cover large swaths of land and provide the rights to fish, hunt, and gather on these lands undeterred and unharmed by extraction projects (or any other project for that matter). But the legal and political prowess wielded by major corporations²⁸ and land owners make it an uphill battle. The fight for a healthy climate and thriving biodiversity is really a fight for justice and a stronger democracy. Just as greed and dominance has constructed our current crisis, unity and equality will logically be what undoes it. And steps are being taken.

In 2007, the United Nations Declaration of the Rights of Indigenous Peoples was adopted by the General Assembly after 143 member states voted in its favor. The declaration states, “Indigenous peoples have the right to the conservation and protection of the environment and the productive capacity of their lands or territories and resources.” And they have “the right to redress” for the lands that “have been confiscated, taken, occupied, used or damaged without their free, prior and informed consent.”²⁹

That being said, having those rights asserted and enforcing those rights are two separate things. But it should be noted that organizations like EarthRights International, whose sole mission is to “challenge the injustices of the legal, economic and political systems that favor wealthy and powerful institutions at the expense of local communities and sensitive ecosystems around the world,”³⁰ are part of a growing representative force for some of the world's least represented peoples. Moreover, coalitions like the United Nations Environmental Development Program are helping communities all across the globe learn and practice healthy, environmentally conscious land practices such as agroecology and agroforestry.

Furthermore, organizations like 350.org have brought their amazing organizational power to bear: in one of their more recent victories, together with the DivestNY coalition, the \$226 million dollar New York pension fund will divest from the riskiest oil and gas companies within four years and decarbonize its entire portfolio by 2040³¹ (this is perhaps a sluggish start but noteworthy nonetheless). Also, with environmentalist like Chris Lang who runs the watchdog

²⁸ See *Buckley vs. Valeo* and *Citizens United vs. Federal Election Commission*

²⁹ Klein., 377.

³⁰ “What We Do.” n.d. EarthRights International. <https://earthrights.org/what-we-do/>

³¹ Richard Brooks, 2020. “Breaking! New York State \$226 Billion Pension Fund to Divest from Riskiest Oil & Gas Companies!” 350.org. December 9, 2020.

website REDD-Monitor that exposes many of the atrocities committed in the name of carbon trading and offsetting, along with Desmogblog.com whose team perpetually calls attention to mishaps, disillusionment, and realities of climate related issues, the proportion of individuals informing themselves, keeping updated and making a change is steadily on the rise. Given that these extractive practices have had such a profoundly degrading impact, 'clean energy' would seem sociopathic to not pursue- and it would be. But that doesn't absolve 'clean' technology and the necessary transition from similar impacts.

'Clean Energy'

As a peremptory disclaimer, this next section is not intended to discredit and disparage renewable energy technologies or the much needed transition into a renewable platform. But in the spirit of honesty, it must be given the same analytical analysis as the industries and practices mentioned above. For accepting the term 'clean energy' at face value and caring on in a business as usual way could potentially perpetuate a similar version of the status quo, merely with an updated system of energy production. This could potentially obscure destructive practices even further, create a new set of social issues, and ultimately continue contaminating the planet. As we shall see, there isn't particularly an energy problem but more of a learned social dilemma inhibiting planetary homeostasis.

However, it should be mentioned explicitly that transitioning to a fully non-carbon emitting energy grid is not simply a theoretical or idealistic goal. It is an imperative task that needs to be done much sooner than later if we're to prevent runaway climate change, in which any attempts by humans to fix it will be rendered utterly futile. But during this transition, I think there are specific aspects that should be mentioned and acknowledged to provide a groundwork for the change needed. What I mean by that is simply adding a plethora of more solar panels and wind farms to the grid is not going to fix the issue; technology is not going to fix the climate crisis. Technology will play a vital role in the transition, but it isn't a cure on its own. There needs to be a concerted effort to remove, displace, and keep fossil fuel reliance out of the equation while drastically reducing our consumption of energy in general. And when fossil fuels are absolutely necessary, we need to contain their use to the utmost bare minimum level.

Displacement

This brings us to the first major dilemma renewables currently face, that being their poor ability to actually displace fossil fuels. It is often assumed that the more non-fossil fuel energy

sources that we add to our system will have an equally diminishing effect on fossil fuel production; thus, for every one unit of non-fossil fuel energy produced, one unit of fossil fuel energy is displaced. In theory this makes sense, but, in reality, it is much more complicated. Professor of Sociology and Environmental Studies at the University of Oregon, Richard York, conducted a study which looked at 132 nations from 1960-2009 to look at displacement directly and the results that he found were quite underwhelming. Through his quantitative empirical study, he was able to isolate the proportion of electricity production which came from renewable sources. And, by contrast, he was also able to isolate the per capita usage of electricity that came from burning fossil fuels over that same time horizon.³²

His first model looked at electricity production in kilowatt hour per capita from fossil fuel sources. Using GDP (and accounting for growing demand) he found a displacement coefficient of -0.089. Meaning that in order to displace 1kWh of fossil fuel electricity we would need to produce more than 11kWh of non-fossil fuel electricity. ($1/0.089 = 11.236$). However, when he expanded the list of contributing variables to include increasing urbanization, industrial manufacturing capacity, and the energy consumption of different demographics of the population, it became clear that would require even more renewable energy capacity to displace the same amount of non-renewable energy output. Thus resulting in almost 13kWh of non-fossil fuel electricity needed to displace 1kWh of fossil fuel generated electricity. While he did not have a complete data set for all the countries in this part of the study, it seems clear that when these factors are accounted for, the task of displacement is all the more complicated.

All of this suggests that production over here doesn't necessarily mean less production over there, but produced energy is only the beginning of the cycle. How energy is used (through electricity and other means) is how we control and maintain the energy produced and also has plenty of room for improvement. Models 3 and 4 look at total national energy use per capita from fossil fuel sources, measured in the equivalent of kilotons of oil. His third model thus found it would take about 8 kilotons ($1/0.128 = 7.813$) of non-fossil fuel energy to displace 1 kiloton of fossil fuel energy. Model 4 concluded it would ultimately take what is the equivalent of $4 \frac{1}{2}$ kilotons of burned oil in non-fossil fuel produced electricity to offset 1 kiloton of oil burned to produce that same amount of energy.

³² Richard York, 2012. "Do Alternative Energy Sources Displace Fossil Fuels?" *Nature Climate Change* 2 (6): 441–43.

In Model 5 (using just GDP) and 6 (with added variables) he narrowed the study even further to look specifically at certain non-fossil fuel systems and measure their relative displacement against fossil fuel production, again measured in kilowatt hour per capita. He found that nuclear displaces the most with hydropower at about half as much and non hydro-renewables (meaning wind, solar, geothermal, tides, biomass and biofuels) didn't offset at all. This implies that non hydro-renewables are currently simply being added to the energy mix.

All of this is a serious cause for alarm because it exposes an extremely deep-rooted dependency on fossil fuels. Even in the best case scenario with the most effective non-fossil fuel source of displacement, nuclear energy, the net effect was miniscule at best. And even more alarming is that the highly praised and widely touted non hydro-renewables are having the opposite effect (albeit very slight). So, while it is true that these energy sources don't produce carbon during operation, if they're not actually getting rid of what they're designed to replace, how much ecological salvation are they really bringing? Simply adding to supply will only increase demand, resulting in more consumption and increased material use.

There are many reasons for these underwhelming numbers, and in the case of renewables, that small number is in large part due to the relatively small implementation of them on a grand scale. It is also at least partially attributed to the already established energy system infrastructure and prevalence that operates on fossil fuels, locking it in as a base source of energy, as well as the previously outlined political prowess of the fossil fuel industry.

It should be mentioned though that this study was conducted in 2012, and we have made drastic improvements within renewable efficiency, technology and cost since then which should ultimately help displacement occur at a faster rate. Through an email conversation, Professor York mentioned that while he believes displacement may be occurring at a better rate, the fear is still that climate/energy issues are framed as merely a technological problem.³³ In his study, he mentions that perhaps the best approach to rapid displacement is a direct suppression approach (say, with a carbon tax) coupled with finding ways to alter the political and economic atmosphere to make it easier for displacement to occur, while curbing energy consumption as much as possible. And while a carbon tax and curbing consumption sound like goals within reach, altering the political and economic atmosphere will be decidedly more difficult.

³³ Letter to Richard York. 2021. "Email Correspondence." Email, January 24, 2021

New dog, old tricks

In 2008 the Department of Energy put out a study called *20% wind energy by 2030* concluding that filling 20% of the nation's energy needs with wind power will come at a modest cost and is achievable by 2030. The four major contributors to the study, the trade organization American Wind Energy Association (AWEA) and three consulting firms, Black and Veatch, Energetics Incorporated, and Renewable Energy Consulting Services, unsurprisingly put forth a glowing review for the positives of wind energy. However, the contemporaneous field data collected by the DOE on wind turbines was not nearly as optimistic, and it certainly did not provide the necessary support to buttress the phrase “20% by 2030”. The ambitious report that was ultimately disseminated was more specifically underpinned by the cost projections and key capacity of factors of one particular consulting firm—Black and Veatch.

They begin with a capacity factor of 35-52% in 2010 (capacity factor being the full potential output of a plant that is actually achieved). For instance a 1000 kWh farm with a capacity factor of 35% produces 350kWh. At first glance, this number might seem underwhelming; however, the typical capacity factor of wind farms is far lower than one might imagine. In fact, the DOE’s 2018 wind report states that we just reached a fleet wide capacity factor of 35% a mere 3 years ago³⁴. If this is the Department of Energy’s average, then one has to question how Black and Veatch arrived at the high-end projection of 52%. Given that wind farm capacity factors usually go up when first installed and then level out or go down as more turbines are situated in sub prime locations, a project of this size simply could not achieve this capacity factor. This makes Black and Veatch’s projections questionable at best, and duplicitous at worst.

They came up with the cost and capacity projections from technology improvements and cost reductions from the 1980’s and 1990’s and then just applied them to the current decade instead of considering market maturation. Liz Hartman, one of the editors of the report is quoted in an interview about these projections saying “the work used input information and assumptions that were forward-looking rather than constrained by recent history.”³⁵ In other words one might say that instead of using recent and up to date data about the reality of wind turbines, they came

³⁴ Ryan Wiser et al. 2018. “2018 Wind Technologies Market Report.” *Energy.gov*. U.S Department of Energy.

³⁵ Ozzie Zehner, 2012. *Green Illusions*. (University of Nebraska Press) 56

up with preposterously inflated projections by distorting their findings with inputs that they were fully aware would produce overestimations of the net benefit.

This story has all the underpinnings of a cover up. But as Ozzie Zehner, the interviewer, explains, it's more of a standard procedure: "Energy corporations develop 'forward-looking' datasets favorable to their cause, government employees slide those datasets into formal reports, the Department of Energy stamps its seal on the reports, and the Government Printing Office publishes them. Then legislators hold up the reports and argue legislation, the legislation guides the money and the money gets translated into action- usually actions with productivist leanings."³⁶

This story is important because it shows similar trends of an outdated system operating in an emerging field that can potentially help planetary homeostasis and the inhabitants within; prioritizing profit and business before care and concern. If we have the same goal, same values, and same practices, but just a different product, similar negative externalities are bound to occur. Accurate projections to be considered during a renewable transition should account for the environmental impacts that this transition will undoubtedly incur. Renewable energy, specifically wind and solar, are becoming the norm and not the exception in many regions but to assume these energy providers are 'clean' would be to ignore the large swaths of land and materials that define these products, the processes used and byproducts made in the production of the equipment, and the social cost of both those things.

Wind

Any discussion on the impact of wind energy infrastructure must account for the incredible amounts of land it takes to operate, and with increases in the size of the turbines and scales of the operations, we need to ensure that proper land use practices are being implemented when considering a new wind farm. Wind turbines need to be spaced at least five rotor diameters apart side-to-side and at least ten rotor diameters front to back in order to prevent a wind 'shading effect'.³⁷ And with 87% of newly installed turbines in 2018 (U.S) featuring rotor diameters of greater than or equal to 110 meters (360 feet), and 30% of turbines having rotors greater than or equal to 120 meters (393 feet)³⁸ that is a whole lot of land. To put that into perspective, say you have four wind turbines with a rotor diameter of 110 meters; you will need

³⁶ Zehner., 58

³⁷ Zehner., 55.

³⁸ Wiser et al.

3,740 square meters of land to install these four turbines. Given that an acre of land is 4,046 square meters, it takes just under an acre to house four typical turbines. And with an average of 3,000 wind turbines being built each year (in the U.S) since 2005³⁹ greater consideration will need to be given to the implicit encroachment into other areas as we move into the future.

This is not only a problem in the U.S; it will effect any place that already has an established and thriving ecosystem that needs to be protected. In Scotland between 2014 and 2016, a total of 6,409 acres of forestry were felled to make way for wind farm developments.⁴⁰ Wind farms are great for the non-carbon emitting aspect of their operation, but if we are cutting down carbon sequestering forest in order to not emit carbon, atmospheric levels will unquestionably continue to rise. And when installing new wind farms anywhere, it should be taken into consideration the amount of concrete required to safely set up a single turbine.

While no construction method is completely devoid of emissions at scale, concrete is especially environmentally problematic for many reasons, not the least of which is the heavy reliance on cement. It is estimated that for every ton of cement produced, one ton of CO₂ is released, and turbines in the 1 to 2 MW range typically use 130 to 240 m³ of concrete for the foundation.⁴¹ This was just the most recent report I could find on concrete use too, it came out in 2004 but as of 2018 our average rated (nameplate) capacity of newly installed wind turbines in the United States was 2.43 MW.⁴² Taking that into consideration the estimated 240 m³ of concrete has probably increased since those statistics were compiled, but even if they weren't, that would still equal roughly 313 cubic yards of concrete. None of this is to say wind power should not play a vital role in reaching carbon neutrality, but perhaps trying to make due with (or at least get the most out of) the operational farms in existence, while drastically dropping our consumption, would behoove us as opposed to overproducing. And nowhere should more consideration be taken than with the life cycle of our solar farms.

Solar

Solar photovoltaic (PV) energy offers a plethora of ecological benefits both globally and locally. This includes the drastic reduction of CO₂ emissions during energy production.

³⁹ "How Many Wind Turbines Are Installed in the U.S. Each Year?" n.d. [Www.usgs.gov](http://www.usgs.gov). Accessed March 18, 2021.

⁴⁰ Dean Herbert, 2018. "Huge Areas of Forest Destroyed to Make Way for 7 Wind Farms." National Wind Watch. January 2, 2018.

⁴¹ M.L Berndt, 2004. "Sustainable Concrete for Wind Turbine Foundations." *Bln.gov*. Brookhaven National Laboratory Upton, New York 11973-5000: Energy Resource Division.

⁴² Wiser et al.

Moreover, once they're installed, they are silent and rather maintenance free, and they have a long operational life cycle. Furthermore, solar energy is becoming increasingly cheaper, and can be produced wherever the sun shines, reducing the need for lengthy power lines and additional transmission infrastructure. These are all immensely powerful tools that need to be utilized during the transition away from a completely fossil fuel dependent energy system, but this does not absolve solar energy's environmental consequences. If CO₂ emissions from extraction, production, transportation and installation are added back into the life cycle analysis, we end up with less of a golden goose solution and more of a system that needs to be monitored and controlled to make sure the energy used (as CO₂ emissions) can more quickly become energy saved (as non-CO₂ emitting solar panels). In the following paragraphs, I will go over the life cycle of solar panels to try and locate areas of contention that need to be acknowledged as we ramp up our solar productions.

Solar PV comes in three different types: monocrystalline (made from a single silicon crystal usually black), polycrystalline (made from many silicon crystals usually blue), and thin film (seen in calculators and watches and made from amorphous silicon). Monocrystalline panels have an efficiency rating of 13-19% but are much more costly and difficult to produce than polycrystalline panels, which have an efficiency rating of 9-14%. Thin film, while having the lowest efficiency rating of 5-7% are the cheapest and least chemically invasive to produce as the process is basically just coating glass with semiconductor material.⁴³

In any case the foundation of a solar panel is silicon, and because elemental silicon is not a naturally occurring material anywhere in the world, there is a lengthy and intensive production process to create the refined quality grade silicon needed for solar panels. To begin, we need to mine high purity quartz from solar grade deposits and break it up into about fist sized lumps to be sent to the smelter. The quartz mines themselves where the raw materials come from put the workers at risk of the lung disease silicosis- not to mention all the operational equipment running on oil and gas. From here, the quartz needs to be refined into metallurgical grade silicon. To do this requires a cornucopia of carbon deposits and energy resulting in about 5-6 tons of CO₂ produced for every ton of metallurgical grade silicon smelted.⁴⁴ The quartz is taken to a

⁴³ Russel H. Plante, 2014. *Solar Energy, Photovoltaics, and Domestic Hot Water : A Technical and Economic Guide for Project Planners, Builders, and Property Owners*. Amsterdam. (Boston: Academic Press).

⁴⁴ Thomas Anthony Troszak, 2019. "(PDF) Why Do We Burn Coal and Trees to Make Solar Panels?" ResearchGate. November 14, 2019.

submerged-arc furnace that takes up to 45 MW of electricity to run. Then it is dumped inside gigantic electrodes that reach up to 3000 °F or greater and is combined with other carbon products to act as a reducing agent. A reducing agent is sort of like a filter: it's a high carbon content material that allows unwanted materials (typically oxygen) to be released as gases or slag to leave behind the desired product- in this case, metallurgical silicon. To do this process requires the burning of coal, coke, charcoal, and wood chips—all of which emit significant amounts of carbon into the atmosphere as a result.

“Blue Gem” coal coming mostly from Colombia, the U.S, and Venezuela, is used as one of the main reducing ingredients in the smelting process. Combined with metallurgical coke (metcoke) and petroleum coke (petcoke). Metcoke is made from coal in basically the same process as making charcoal. Airflow is restricted to a large mass of burning coal to burn off about 40% of the coal and leave behind a silvery grey coal-like chunk that has a significantly higher carbon content per ton than the original coal. Petcoke comes in the form of carbon rich pellet-like pieces as a byproduct of crude oil refineries or directly from raw bitumen. Charcoal is also needed during the smelting process and comes from hardwood trees. Again being burned with restricted oxygen levels and losing about 75% of the original material in the process as burned off carbon monoxide (CO), carbon dioxide (CO₂), smoke and heat. Hardwood chips (shredded hardwood) must also be included in the smelter to allow the reactive gasses to circulate and be released from the smelter safely while also allowing the liquid silicone to sink to the bottom. It is estimated that for one ton of metallurgical grade silicon to be produced it requires 2.4 tons of quartz, 550 kilograms of coal, 200 kilograms of oil coke, 600 kilograms of charcoal and 300 kilograms of wood chips.⁴⁵ So aside from acknowledging and responsibly operating (to the best of our abilities) the carbon-based fuel requirements needed for the coal, metcoke, and petcoke; special attention needs to be paid to where and how we are sourcing the charcoal and wood chips required as well. For if these wood products are illegally mined and contributing to deforestation the ecological desolation and carbon footprint of these panels will continue to rise. And that’s just the first step.

The metallurgical grade silicon is only about 99% pure and needs to go through another refining process to create polysilicon rods that are 99.9999% pure. To do this silicon gas (made from the metallurgical silicon) and hydrogen gas are passed through a vessel and cling to an

⁴⁵ Troszak.

electrically heated filament creating polysilicon rods (pure silicon). This rod production process takes days to complete and requires a 24/7 supply of electricity. After these rods are fully refined they are sawed or broken into chunks to be used in the crystal growing stage.

In order to produce the monocrystalline PV, which is used to make the solar panels with the highest efficiency rating, a process not dissimilar to growing rock candy is implemented. Molten polysilicon is housed in a rotating tank (with boron to give the silicon a positive charge) and a small 'seed crystal' is lowered into it. As the seed crystal is very slowly drawn out a crystal begins to form at the tip and as the tank continues to rotate the crystal increasingly becomes larger. Once complete you are left behind with a huge positively charged cylindrical crystal called an ingot. This ingot then gets the top, bottom and sides cut off to leave a large brick-like shape that will then get sliced into wafers that become the cells you see in the solar panels. Again, this ingot production takes days to complete and requires an uninterrupted supply of electricity. Polycrystalline PV production is similar, but relatively less intensive. However, both processes require a surprising amount of energy and carbon based fuels; thus, we need to start including these factors when accounting for the carbon emissions that are inherent to the transition to these "green" energy sources.

These wafers are then made into cells by adding layers of different materials and components such as silver, zinc, tellurium, tin and others. The layers are then assembled into modules and coated with phosphorus to give the surface a negative charge and allow for the conversion of sunlight into electricity. They are then given a protective glass cover, housed in aluminum frames and accompanied with copper wiring to transfer the electricity. None of this to mention the extraction sites for all the rare earth minerals included in these panels or the land and concrete used for installation as well.

But there is more to consider. Photovoltaic production requires a slew of toxic components aside from just the raw materials. During their manufacturing, they are one of the largest emitters of hexafluoroethane (C₂F₆ 12,000 times more potent than CO₂ and survives 10,000 years once released) nitrogen trifluoride (NF₃ 17,000 times more potent than CO₂) and sulfur hexafluoride (SF₆ 25,000 times more potent than CO₂).⁴⁶ These gases are used to clean the plasma production equipment during manufacturing and are strikingly more toxic than CO₂.

⁴⁶ Zehner., 18.

Also, the production of polysilicon produces the byproduct silicon tetrachloride, an extremely toxic waste product that will destroy land cultivation and poison the surrounding air quality if improperly disposed of. For each ton of polysilicon produced, the process generates at least four tons of silicon tetrachloride liquid waste.⁴⁷ In one reported incident, the Chinese company Luoyang Zhonggui High-Technology Co. was caught dumping truckloads of silicon tetrachloride directly onto the ground between crops and a primary school, resulting in adverse health effects for nearby residents as well as detrimental soil contamination. The same report mentions that in developed nations polysilicon producers will recycle this material, but due to the high investment costs and time, as well as the enormous energy consumption required for heating the substance to more than 1800 degrees Fahrenheit, many companies in China skip this step. Although, in 2011, China set standards requiring that companies recycle at least 98.5 percent of their silicon tetrachloride waste,⁴⁸ but as we've seen before, having rules and following them rarely coincide in these industries. And not only is the waste from polysilicon toxic but the actual solar panels themselves become a toxic form of e-waste at the end of their life.

By 2050, the International Renewable Energy Agency projects that up to 78 million metric tons of solar panels will have reached the end of their life (solar PV panels typically last up to 20-25 years), and that the world will be generating about 6 million metric tons of new solar e-waste annually.⁴⁹ Moreover, most current recycling options available don't have systems in place to salvage the silver, silicon and other materials from wasted panels. One company in France, Veolia, and the world's only commercial scale silicon PV recycling plant say they have the technology to recapture 95% of the material present in a solar panel.⁵⁰ But here in the U.S we have a much worse system in place. It is estimated that about 10% are recycled here, with the rest going to landfills or overseas for reuse.⁵¹ And when they end up in landfills, they begin to leach toxic chemicals into the ground and eventually the water supply. The EU seems to be leading the way in recycling, not only with their advanced technology but also with their level of

⁴⁷ Ariana Eunjung Cha, 2008. "Solar Energy Firms Leave Waste behind in China." *Washington Post*, March 9, 2008.

⁴⁸ Dustin Mulvaney, 2014. "Solar Energy Isn't Always as Green as You Think." *IEEE Spectrum: Technology, Engineering, and Science News*. IEEE Spectrum. November 13, 2014.

⁴⁹ Maddie Stone, 2020. "Solar Panels Are Starting to Die, Leaving behind Toxic Trash." *Wired*. August 22, 2020.

⁵⁰ "Veolia Opens the First European Plant Entirely Dedicated to Recycling Photovoltaic Panels." 2018. Veolia. July 5, 2018.

⁵¹ Stone.

concern for the afterlife of these panels. In Europe, solar panel producers are required to ensure their solar panels are recycled properly through their Extended Producer Responsibility (EPR) program. It does exactly what it sounds like; it requires the producers of these panels to take them back and dispose of them properly when their life cycle is up. The U.S is beginning to see a sluggish start in this direction: beginning in 2020, manufacturers wishing to sell in Washington or New York will have to participate in some sort of take back or EPR program.⁵²

Needless to say, solar panels are much more complicated than they seem. And while the production of solar PV panels is extremely carbon, resource and energy dependent, unlike fossil fuels, they at least could eventually be worth their weight in CO2 reductions. But finding ways to shorten the payback period and increase the reuse economy of panels will be key moving forward. One way to shorten this payback period is to source local solar panels. China produces more than half of the world's solar PV's, which are then predominantly installed in Europe and the U.S. So if you take all of the gas and oil out of that transportation by installing panels made closer to home, they can start a positive ecological return much faster. And while the Veolia recycling plant might not be an option for every nation it is appalling and ecologically offensive that the U.S doesn't have something along those lines established here. Especially considering we like to pride ourselves as being leading innovators in new industries while politically, a Democratic President and a Democratic House and Senate continue to pontificate about the “green” revolution of the economy—signaling to the private sector that a windfall of government contracts and subsidies will be available for companies innovating in these spaces.

Hydroelectric

Hydroelectric power is the most widely used renewable energy source at present, providing 71% of global production of renewable energy.⁵³ Simply put, utilizing water as a renewable energy resource far outdates the Industrial Revolution, and it was never completely abandoned after the energy potential of carbon-based fuels was realized. It is an immense source of energy that unlike solar and wind can generate power whenever it is needed, although not without a palpable amount of controversy. Perhaps the most drastic of which revolves around hydroelectric dams.

⁵² Dustin Mulvaney, Morgan D. Bazilian. 2019. “The Downside of Solar Energy.” Scientific American Blog Network. December 1, 2019.

⁵³ Emilio F. Moran et al. 2018. “Sustainable Hydropower in the 21st Century.” *Proceedings of the National Academy of Sciences* 115 (47): 11891–98.

Dams can be built through lakes or rivers, and when built through rivers they can create intense international controversy due to the fact that when you build a dam, the downstream communities are now subjected to a lack of water control and use. Furthermore, the upstream communities become restricted in their water use in order to ensure reservoir levels. This can have a profound effect on agricultural production and agrarian societies relying on a continuous flow of water. In all, internationally shared rivers flow across the borders of 145 countries,⁵⁴ so when one decides to dam a section of one of those rivers up, it's easy to see why it does not remain an isolated event. They have an incredibly vast spatial impact as well as a huge environmental impact.

When any dam is constructed it will inevitably alter the established aquatic and terrestrial biodiversity as well as affect the nutrient flows, resulting in depleted water quality. Furthermore, the construction requires deforestation by either cutting down trees to make way for the reservoir, or flooding the trees that end up in the reservoir zone, ultimately killing them. This deforestation is considered 'upstream' emissions (occurring at the reservoir), but there are also 'downstream' emissions.

Water in dams will stratify by temperature. Warm water at the top that is in contact with air and contains oxygen, which usually makes up about the first 2-10 meters, is called the epilimnion; the cold layer at the bottom, called the hypolimnion, usually contains very low levels of dissolved oxygen and creates anoxic water conditions. This is less than ideal for the atmosphere as the byproduct of decaying organic matter in anoxic water conditions is methane—also a greenhouse gas. This decaying organic matter can come from decaying sediment at the bottom of the reservoir as well as dying vegetation that grows in the drawdown zone when water levels are low, only to be flooded again when the water rises. Then, just like a soda bottle, when the water is released from the bottom of the dam, this change in pressure releases the methane bubbles. The methane produced by dams is hardly recorded and difficult to measure, but it must start to be considered if we are to accurately reduce emissions, because simply not accounting for them doesn't make them less damaging.

Therefore dams, like everything else, will always have a social and ecological impact. As such, they should be implemented with a diverse sense of care and concern, and they must take into account the totality of their operational costs. There are also many new developments being

⁵⁴ Zehner., 135.

made in hydro power that address some of these issues. Tidal power and incurrent turbines are two versions of lower impact solutions, but they have yet to be implemented on a commercial scale. Perhaps one of the best actions to take with hydro dams is just to waste less of the energy already obtained from them. Instituting electrical pricing and efficiency strategies in the U.S at levels already attained in Europe and Japan would effectively double the share of hydropower in the American grid from 5% to 10% without building a single additional dam.⁵⁵ So with all of the associated issues inherent in the renewable energy transition, from societal displacement to environmental degradation, is a ‘green’ society even possible? Perhaps, but not with irreverent economics.

Can the economy be green?

It should come as no surprise that I am not the first to contemplate this question. The peer-reviewed journal *New Political Economy* published an article in 2019 addressing it. ‘Green growth’ is a theory that assumes that our continued economic expansion can be compatible with our planet's ecology. The three major proponents of green growth are the Organization for Economic Co-operation and Development (OECD), the United Nations Environment Program (UNEP) and the World Bank. Each of these established institutions agree that through technological change and substitution we will be able to improve the ecological efficiency of the economy and completely decouple GDP from resource use and carbon emissions. However, how can one make an assessment of the progress on such a lofty goal? To calculate an economy's material use, the Domestic Material Consumption (DMC) metric is used. This considers the total weight of raw materials (biomass, minerals, metals and fossil fuels) extracted from the domestic territory, plus all physical imports minus all physical exports. To see if an economy is moving towards green growth many governments have adopted the system of dividing GDP by DMC. If GDP is growing faster than DMC, then there is a relative decoupling and a move towards greater resource efficiency in that economy.

However, the DMC metric is problematic because it doesn't include the material impact involved in the production and transport of imported goods. Ultimately, this needs to be considered in a growing globalized economy in which rich nations outsource much of their production to poorer countries. With outsourcing, foreign material consumption gets expunged from their balance sheet, offering a narrow view of an economy's green growth. If you bring that

⁵⁵ Zehner., 135.

back into the equation and look at the total resource impact of consumption by any given nation, it shows their more accurate Raw Material Consumption (RMC) or Material Footprint (MF). With the MF considered, we can see that while relative decoupling of GDP and DMC has happened, the global MF is increasing at a faster rate than both population and economic output.⁵⁶ Materialflows.net, which is run by the Vienna University of Economics and Business has compiled data from 1970-2017, which shows that our global material footprint grew 240% in just under fifty years, reaching nearly 92 billion tons.⁵⁷ The UN report concludes, “at the global level, there has been no decoupling of MF growth from either population growth or GDP growth. It is imperative that we reverse that trend.”

So how do we reverse that trend? Simply put, all of these projections have a common denominator- perpetual growth. All of the studies cited in the New Political Economy article project growth at 2-3% per year, but it is mentioned that as GDP growth rates reach less than 1% and climb closer to 0, absolute decoupling and green growth becomes much more feasible and will last longer. Our global material footprint needs to be drastically reduced as well, with some studies suggesting that it needs to be 50 billion tons per year and this needs to happen by 2050.⁵⁸ Here, it must be noted that this will be a much more viable goal if GDP growth holds at roughly 0%. So, while decoupling resource use and GDP still has a long way to go that is only one part of this study...the question still remains, can we reduce emissions fast enough to meet the 1.5 or 2 °C mark set by the Paris Agreement while continuing to grow the economy?

Historically, emissions have been on a continuous rise with drops only occurring during economic recessions. While there is some evidence that relative decoupling of GDP and carbon emissions has occurred, on average, our current trends are incompatible with the Paris Agreement. The Intergovernmental Panel on Climate Change’s (IPCC) fifth assessment report (AR5) assessed the scientific, technical, and socio-economic information regarding climate change, and it offers 116 mitigation scenarios that offer different solutions to staying below 2 °C. All of these scenarios fall under the umbrella of “green growth strategies” given that they stabilize global temperatures while GDP continues to rise. Although, the AR5 warns that these scenarios ‘typically involve temporary overshoot of atmospheric concentrations’ and ‘typically

⁵⁶ United Nations Statistics Division. 2019. “— SDG Indicators.” Un.org. 2019.

⁵⁷ Vienna University of Economics and Business. n.d. “Data Visualisations – Materialflows.net.” Materialflows.net. Accessed March 24, 2021.

⁵⁸ Jason Hickel, Giorgos Kallis, 2019. “Is Green Growth Possible?” *New Political Economy* 25 (4): 1–18.

rely on the availability and widespread deployment of bioenergy with carbon capture and storage (BECCS)?⁵⁹

It is mentioned that 101 of the 116 scenarios rely on BECCS to achieve negative emissions, and 9 more rely on BECCS but don't reach negative emissions. BECCS entails growing large tree plantations to sequester CO₂, then cutting the trees down and burning them for energy while capturing the emissions on site and then storing them deep underground. This is a highly controversial practice; author's, Michael Obersteiner and David Keith, designed it as a sort of backup plan if climate change's negative feedback loops turn out worse than expected. Yet, with the publishing of the AR5 report, this practice seems to have become the assumed course of action, but the reality is that this is a high stakes gamble, and experts in the field often utilize it in support of the need to find an alternative approach.

However, the question remains, can we still reduce our emissions sufficiently without BECCS? The six scenarios in the AR5 that don't include BECCS work by assuming 'optimal full technology' in all other areas, plus mass afforestation, and with high mitigation costs.⁶⁰ It is mentioned that, theoretically we can get to net 0 by 2050 if a) we switch to a renewable energy platform to cut emissions from fossil fuels b) practice afforestation and soil regeneration to eliminate emissions from land use and c) a shift to alternative industrial processes to eliminate emissions from the production of cement, steel and plastic.

But the question is if we can do it fast enough. Another way to approach this question is by looking at projected rates of decoupling. If we assume global GDP continues to grow at 3% per year (the average from 2010 to 2014), then decoupling must occur at a rate of 10.5% per year for 1.5°C, or 7.3% per year for 2°C. If global GDP grows at 2.1% per year (as PricewaterhouseCoopers predicts), then decoupling must occur at 9.6% per year for 1.5°C, or 6.4% per year for 2°C. All of these targets are beyond what existing empirical models indicate is feasible.⁶¹

All this suggests that while decoupling can and is happening in some places, current economic expansion rates are not compatible with staying below the 2 °C target. But a growth rate of 0% would only require a decarbonization rate of 4% per year. "In other words, it is empirically feasible to achieve green growth within a carbon budget for 2°C with the most

⁵⁹ Hickel, Kallis, 2019.

⁶⁰ Hickel, Kallis, 2019.

⁶¹ Hickel, Kallis, 2019.

aggressive possible mitigation policies if the growth rate is very close to zero and if mitigation starts immediately. However, emissions reductions in line with 1.5°C are not empirically feasible except in a de-growth scenario.”⁶²

Moving forward

As you can see, extractivism, fossil fuel dependency, climate change and associated responses such as renewable energy, sustainability and green technology do not occur in a vacuum. They are all interdependent upon each other and affect each other accordingly. They are also performed and measured through human action and the socio-environmental costs related, suggesting that if a planetary homeostasis is the goal, no technological breakthrough, or market-based solution will get us there; both of those things can be utilized, but, ultimately, it is the actions, decisions and values of humans that determine the atmospheric levels of carbon dioxide and associated gases. This has led me to believe that cooperation, not competition, needs to be the driving economic force; there needs to be a much higher level of governmental trust coupled with adequate and appropriate governmental actions in order to ensure that oversight and regulations are deemed necessary, honest and healthy (to ecology not business) and that these oversights and regulations are actually honored and upheld by the companies that they affect. We need to over value positive quarterly reports measuring social and ecological health as opposed to quarterly reports favoring short-term profits for businesses. And I think this can all be developed by a consistent closing of the immense wealth gap. Not merely financial wealth, but wealth of access, opportunity, suffrage, health (both mental and physical), safety, healthy food and clean water. If shit rolls downhill- and you get rid of the hill- then everyone has to clean up after themselves.

We need to develop this sense of care, concern and deployment much faster than currently expressed while simultaneously reducing our fossil fuel dependency at an overwhelming rate. I think it's become clear that an outright erasure of fossil fuels is simply impractical, but there is an abundance of areas where they're unnecessary and can be eliminated. And there is hope for that outcome: oil extraction is slowly becoming outdated and unprofitable with many (mostly non-U.S) companies exploring and investing in alternative solutions. But the most important focus during the phasing out of fossil fuels and the introduction of renewables is that we don't use antiquated tactics with a new product. If solar panels are seen as just another

⁶² Hickel, Kallis, 2019.

profitable avenue as opposed to being seen as a means to an end, and we commence to outsource, overproduce, and deregulate their market, they will quickly become a planetary bane instead of utilizing their latent potential.

In short, if we want a healthy planet to live on, we need healthy people to live on it. We can't expect to exploit, mistreat and undervalue each other while maintaining a safe biosphere; in other words, you can't decouple social norms and values from biological homeostasis. We also have to try really hard. It's unfortunately a privilege now to merely carry on about your days with a passive interest in the issue; if we want suicidal levels of carbon in the atmosphere all we have to do is nothing. A business-as-usual approach is exactly what got us here in the first place. So that would suggest a more robust action-based platform is required- for individuals, organizations, and governments. That is the only true way to ensure prosperity for the sake of posterity. All of this will have the symbiotic solution of generating vast amounts of wealth for the same individuals, organizations, and governments on top of protecting and preserving the earth's resources and all its human and non-human inhabitants. It will take everyone to ensure safety for anyone.

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<https://www.bnl.gov/isd/documents/26626.pdf>

. I found this report when looking for how much concrete is necessary to safely install wind turbines and used that information as well as some of their findings about emissions from concrete production.

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Brooks, Richard. 2020. "Breaking! New York State \$226 Billion Pension Fund to Divest from Riskiest Oil & Gas Companies!" *350.org*. December 9, 2020.

<https://350.org/divestnyvictory2020/>

. This article was used to show some of the recent accomplishments made in the fight against extractivism.

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Cha, Ariana Eunjung. 2008. "Solar Energy Firms Leave Waste behind in China." *Washington Post*, March 9, 2008.

<https://www.washingtonpost.com/wp-dyn/content/article/2008/03/08/AR2008030802595.html>

. I came across this story in a few different articles and wanted to read the original account of what happened. I also used supplemental information, aside from the dumping account, about silicon tetrachloride.

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Cunningham, Nick. 2021. "Total Quits Fossil Fuel Lobby Group the American Petroleum Institute over Climate Change." *DeSmog*. January 15, 2021.

<https://www.desmogblog.com/2021/01/15/total-quits-lobby-group-american-petroleum-institute-climate-change>

. This was the first article I found in regards to the European and U.S oil company divide that seems to be occurring. It's nice to see companies headed in a different direction but in no way should be seen as a gold start for these companies. Just because their investing in renewables at home doesn't absolve them from their actions abroad.

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“Dinant - Lo Mejor Para Tí.” n.d. Dinant.com. Accessed March 25, 2021.

<https://www.dinant.com/Division/oil-palm/?lang=en#:~:text=In%20Dinant%20we%20have%2013%2C300>

Fearnside, Philip. 2011. “Greenhouse-Gas Emissions from Tropical Dams.” *Nature Climate Change*, May, 382–84. <https://doi.org/10.1038/nclimate1540>

. This article was used to find out more about the ecological costs of hydroelectric dams. I used this article to describe the process of how these dams generate methane gas.

Financial Times. 2004. “FINANCIAL TIMES Blood and Gore Launch Firm with a Difference,” November 8, 2004.

<http://redd-monitor.org/wp-content/uploads/2020/04/pdf-ft-08-11-04.pdf>

. This was an article that came out when Generation Investment management group was launched. I read it out of curiosity and it ended up showing a less holistic view of GenerationIM, and one more in line with positive numbers at the end of a fiscal year.

“Firm Overview | Generation Investment Management LLP.” n.d. [Www.generationim.com](http://www.generationim.com). Accessed January 22, 2021. <https://www.generationim.com/firm-overview/>

. This is Al Gore and David Blood’s management group that deals in carbon trading, and shows their assets under management. I originally used their September number but as I returned to the site to update my bibliography, I noticed that their assets seemed to have climbed 5 billion dollars in a matter of three months

Hawken, Paul. 2017. *Drawdown : The Most Comprehensive Plan Ever Proposed to Reverse Global Warming*. New York, New York: Penguin Books

. The Drawdown folks are comprised of 70 individuals spanning across 22 countries, half of which have PhDs and the others at least one advanced degree. This book looks at the 100 most beneficial sustainability projects that are currently underway and on the horizon. It analyzes their cost efficiency in terms of dollars and ecology. This is a very uplifting read that provides a solid foundation for a new world with nature at the forefront.

Herbert, Dean. 2018. "Huge Areas of Forest Destroyed to Make Way for 7 Wind Farms."

National Wind Watch. January 2, 2018.

<https://www.wind-watch.org/news/2018/01/02/huge-areas-of-forest-destroyed-to-make-way-for-7-wind-farms/>

. This article was used to show that on occasions wind farms have been known to be directly related to deforestation and that this need to be combated for future farms.

Hickel, Jason, and Giorgos Kallis. 2019. "Is Green Growth Possible?" *New Political Economy* 25 (4): 1–18. <https://doi.org/10.1080/13563467.2019.1598964>

. This article was my foundation and spring off point when considering the detrimental effects that our current obsession with perpetual economic growth has on planetary effects and how they are actually not possible to both sustain. I used many of the findings here within my paper to show current capitalistic tendencies will not allow a safe planet.

"How Many Wind Turbines Are Installed in the U.S. Each Year?" n.d. [Www.usgs.gov](http://www.usgs.gov). Accessed March 18, 2021.

https://www.usgs.gov/faqs/how-many-wind-turbines-are-installed-us-each-year?qt-news_science_products=0#qt-news_science_products

. I used this information to show that wind power has been and is expanding and that during this expansion we need to consider all of their factors.

Jones, Marc. 2020. "COVID Aid Could Bring Years of Austerity, Charities Warn IMF." *Reuters*, October 6, 2020.

<https://www.reuters.com/article/health-coronavirus-imf-austerity-int/covid-aid-could-bring-years-of-austerity-charities-warn-imf-idUSKBN26R1KZ>

. I found this article while looking into current austerity measures in place by international financial institutions, stemmed from reading Christian Parenti's book. This article shows that 500 of the world's leading charities and social groups are worried about having to borrow more money from the IMF due to the "years of austerity" that are coming with these agreements.

“Juana Doe et Al. V. IFC.” n.d. EarthRights International. Accessed January 22, 2021.

<https://earthrights.org/case/juana-doe-et-al-v-ifc/#timelineff69-1a905f26-f4b6>

. This webpage was used as a follow up to the article about farmers in Bajo Aguan. It shows the actual timeline of the court case against IFC and IFC-AMC by local farmers, revealing an audacious lack of review and outright corruption on the part of IFC.

King, Elizabeth. 2019. “THE NEW GREEN SCARE: Lawmakers Are Ramping up Penalties for Protesters Who Take the Kind of Drastic Action Needed to Save the Planet.” *The Progressive*, 19+.

<https://link.gale.com/apps/doc/A604716408/GRNR?u=s5539753&sid=GRNR&xid=6bd099d3>.

. This article was used to touch upon the militarization adaptation of eco-activist in the U.S. It revealed the abuse of power being wielded against protestors by the state and the extents that government is willing to go to in order to continue their status quo. All the while, attempting to sew fear and contempt for the same activists.

Klein, Naomi. 2014. *This Changes Everything : Capitalism vs. the Climate*. New York: Simon & Schuster Paperbacks

. Naomi Klein is a Canadian author known for her criticism of corporate globalization and capitalism. This book has helped better understand the more clandestine, systemic voice against climate science and economic change; and how our current system and values are designed to augment ecological destruction. Perhaps not overtly direct (although in some cases it is) but equally damaging nonetheless.

Krauss, Clifford. 2020. “U.S. And European Oil Giants Go Different Ways on Climate Change.” *The New York Times*, December 11, 2020, sec. Business.

<https://www.nytimes.com/2020/09/21/business/energy-environment/oil-climate-change-u-s-europe.html>

. This is a more extensive article into the U.S and European divide, and really makes U.S companies (specifically Exxon and Chevron) look like petulant megalomaniacs, who are stuck in the past and refuse to accept reality due to grossly short term alliances.

.
Lang, Chris. 2020a. “Planet of the Humans (Part 1): Blood and Gore | REDD-Monitor.”

Redd-Monitor.org. April 29, 2020.

<https://redd-monitor.org/2020/04/29/planet-of-the-humans-part-1-blood-and-gore/>

. This article was used as a follow synthesis up the the actual documentary “Planet of the Humans,” but it ended up leading me into a deeper look into seemingly nefarious the conflict of interest within Al Gores position at the Kyoto Protocol.

.
———. 2020b. “Pakistan Offset Project | REDD-Monitor.” Redd-Monitor.org. September 17, 2020.

<https://redd-monitor.org/2020/06/02/pakistans-tree-planting-programmes-corruption-exclusion-and-marginalisation/>

. I used this article to show that similar humanitarian crises are happening across the globe in the name of “preservation,” and more specifically in the global south. This article is less violent then the one in Honduras but egregious all the same.

.
Lippincott, Jeffrey. Letter to Richard York. 2021. “Email Correspondence.” Email, January 24, 2021

. This was a follow up conversation I had with professor York to ask him about how he felt moral disinhibition and displacement are currently being practiced.

.
Mikulka, Justin. 2020. “Safety Can’t Be a ‘Pretext’ for Regulating Unsafe Oil Trains, Says Trump Admin.” desmog. March 20, 2020.

<https://www.desmogblog.com/2020/05/20/trump-phmsa-safety-washington-vapor-pressure-oil-trains>

. I found this article while scrolling through the Desmog website and thought it was a perfect encapsulation of why the issue of climate change is only partly about the actual climate. I used it as my introduction to my paper.

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Monbiot, George. 2007. "Hurray! We're Going Backwards!" Monbiot.com. The Guardian. December 17, 2007.

<https://www.monbiot.com/2007/12/17/hurray-were-going-backwards/>

. This article lays out the intentions behind the Kyoto Protocol and how the U.S wanted the proceedings to go, resulting in the established global carbon trading market we live with today. It's poignantly interesting to see how European countries were at first hesitant to agree with Al Gore's temper tantrum but conceded in the end and became a major player.

.
Moran, Emilio F., Maria Claudia Lopez, Nathan Moore, Norbert Müller, and David W.

Hyndman. 2018. "Sustainable Hydropower in the 21st Century." *Proceedings of the National Academy of Sciences* 115 (47): 11891–98.

<https://doi.org/10.1073/pnas.1809426115>

. I found this article while looking into the environmental cost of hydroelectric dams. I used some of their figures in my own paper and used this report as a starting point to further look into other ecological cost of dams.

.
Mulvaney, Dustin. 2014. "Solar Energy Isn't Always as Green as You Think." IEEE Spectrum: Technology, Engineering, and Science News. IEEE Spectrum. November 13, 2014.

<https://spectrum.ieee.org/green-tech/solar/solar-energy-isnt-always-as-green-as-you-think>

. This article was used to again look more into the full cost of solar panel production, and it also supplied me with updated information about China's response to the silicon tetrachloride dumping.

.
Mulvaney, Dustin, and Morgan D. Bazilian. 2019. "The Downside of Solar Energy." Scientific American Blog Network. December 1, 2019.

<https://blogs.scientificamerican.com/observations/the-downside-of-solar-energy/>

. This article was found during my search into the recycling issues associated with solar panels and different countries responses to that. I used a section of this piece in my paper to show that there is a start in the U.S to more responsibly recycle our solar panels.

Oli Brown. 2008. "Migration and Climate Change." *ResearchGate*. International Organization for Migration.

https://www.researchgate.net/publication/253396962_Migration_and_Climate_Change

. I found this publication through Christian Parenti's book and used it to read more thoroughly into the climate migrant numbers that were suggested. I ended up finding, according to this report, a pretty apathetic approach to legally defining "climate migrants." There was precedence in place for migrants due to extreme weather conditions like a hurricane but nothing for those who are forced to relocate due to years of drought.

Parenti, Christian. 2012. *Tropic of Chaos : Climate Change and the New Geography of Violence*. New York: Nation Books

. This is an extremely thorough historical book that investigates the aftermath of destruction caused by Cold-War era proxy battles fought in the Global South, coupled with a neoliberal agenda of the the 1990's and some of the outcomes of the deregulation and privatization within said Global South countries (he focuses on the horn of Africa, central Asia, Brazil and Mexico). This is all mentioned under the guise of climate change and how all three of these entities are working lock and step with each other to exacerbate each. It is concluded that the Global North needs to hold itself accountable and mitigate its efforts not narrowly, but with intensive and robust state policies and wealth redistribution.

Plante, Russell H. 2014. *Solar Energy, Photovoltaics, and Domestic Hot Water : A Technical and Economic Guide for Project Planners, Builders, and Property Owners*. Amsterdam ; Boston: Academic Press.

<https://www.sciencedirect.com/topics/engineering/monocrystalline-silicon-cell>

. I found this section of Plante's book while investigating the life cycle of solar panels. I couldn't access the full book but used this section to show the efficiency ratings of each type of solar PV.

Prince, Andrew. 2012. "NPR Choice Page." Npr.org. August 16, 2012.

<https://www.npr.org/2012/08/16/158907708/infographic-how-tar-sands-oil-is-produced>

. This article explains and shows graphics of how the tar sand oil is extracted in comparison to conventional drilling, as well as some heightened ecological obstructions such as it being heavier

than conventional oil and so when it gets into a water stream or bed it sinks to the bottom making it much harder to clean up.

Riofrancos, Thea. 2019. "What Green Costs." *Logic Magazine*, December.

<https://logicmag.io/nature/what-green-costs/>

. In this article Thea Riofrancos describes her on the ground work in Bolivia and what the Lithium mining is doing to local communities and wildlife within and around the The Los Flamencos National Reserve. She mentions this area as a part of the Lithium Triangle, that encapsulates parts of Chile, Argentina, and Bolivia which is furthering my research into the cost of renewable energy.

Ross, Aaron, and Barbara Lewis. 2019. "Congo Mine Deploys Digital Weapons in Fight against Conflict Minerals." Reuters. September 30, 2019.

<https://www.reuters.com/article/us-congo-mining-insight/congo-mine-deploys-digital-weapons-in-fight-against-conflict-minerals-idUSKBN1WG2W1>

. This article talks about new technology being implemented by RCS Global which is supposed to add more accountability and secure a safer supply chain from extraction to production for mines in eastern parts Democratic Republic of the Congo. These are rare earth mines that use these materials for many of the electronics we use everyday along with battery development for renewable storage. This shows a step forward but also calls attention to the black market trade for these same minerals.

Smith, Matthew. 2007. "Environmental Militarism." *Greener Management International* 2007 (52): 47+. <https://doi.org/10.9774/gleaf.3062.2005.wi.00006>

. This article was used as further research into how some extractive projects in the Global South are met with outright unadulterated violence and oppression. It is an intensely sobering article that shows a piece of what these projects look like. Made all the more somber given that it was talking about a natural gas pipeline in context to our current infatuation with natural gas.

Stone, Maddie. 2020. "Solar Panels Are Starting to Die, Leaving behind Toxic Trash." Wired. August 22, 2020.

<https://www.wired.com/story/solar-panels-are-starting-to-die-leaving-behind-toxic-trash/>

. I used this article to look closer at the recycling issue that is associated with solar panels at the end of their life. I used a few of the figures in this article within my paper to show the disparities between the E.U and U.S's approach to recycling.

Troszak, Thomas Anthony. 2019. "(PDF) Why Do We Burn Coal and Trees to Make Solar Panels?" ResearchGate. November 14, 2019.

https://www.researchgate.net/publication/335083312_Why_do_we_burn_coal_and_trees_to_make_solar_panels

. This article was an extremely in depth look at the full cost of solar panel production. I used this to outline the full life cycle of solar panels from extraction to installation. This was used as a baseline for my analysis into the cost of a robust solar energy production.

United Nations Statistics Division. 2019. "— SDG Indicators." Un.org. 2019.

<https://unstats.un.org/sdgs/report/2019/goal-12/>

. This site was used to find the most up to date information I could on the lack of decoupling from material footprint and GDP. I used information from one of their graphs to show that that decoupling is not happening.

"Veolia Opens the First European Plant Entirely Dedicated to Recycling Photovoltaic Panels." 2018. Veolia. July 5, 2018.

<https://www.veolia.com/en/newsroom/news/recycling-photovoltaic-panels-circular-economy-france>

. I came across this company in Maddie Stone's article and found their website to further look into their recycling practices.

Vienna University of Economics and Business. n.d. "Data Visualisations – Materialflows.net." Materialflows.net. Accessed March 24, 2021.

http://www.materialflows.net/visualisation-centre/data-visualisations/?_inputs_&sidebar=%22line_chart_2%22

. This website tracks global material uses and has a plethora of statistical analysis showing different global and national patterns. I used the chart that tracked the global material footprint from 1970-2017. I found this site through Hickel and Kallis's article in which they used the same chart but from 1970-2013

.
"What We Do." n.d. EarthRights International. <https://earthrights.org/what-we-do/>

. This was used to show EarthRights International's commitment statement.

.
Wiser, Ryan, Mark Bolinger, and Lawrence Berkeley National Laboratory. 2018. "2018 Wind Technologies Market Report." *Energy.gov*. U.S Department of Energy.

<https://www.energy.gov/sites/prod/files/2019/08/f65/2018%20Wind%20Technologies%20Market%20Report%20FINAL.pdf>

. This report was used to find contemporary information regarding wind power's updated capacity factors, turbine size, implementation and as a general overview of where wind power is at currently.

.
Wong, Rosie. 2015. "Carbon Blood Money in Honduras." *The Violence of Development*. January 3, 2015.

<https://theviolenceofdevelopment.com/carbon-blood-money-in-honduras/>

. This article was originally published in "Foreign Policy in Focus" on March 9th, 2012 and was republished by "The Violence of Development" with permission from Rosie Wong. This article is used to show a through line of complacency and assistance that the carbon market, specifically the Clean Development Mechanism (CDM), provides to the humanitarian crisis and the mental gymnastics of calling itself "green." It also hints to austerity measures enforced by the international financial institutions (specifically the IFC in this case although not mentioned in this article. For more on this go to <https://earthrightsdefenders.org/story/case-juana-doe-et-al-v-ifc/>) and how then end up directly financing and promoting violence in the global south.

York, Richard. 2012. "Do Alternative Energy Sources Displace Fossil Fuels?" *Nature Climate Change* 2 (6): 441–43. <https://doi.org/10.1038/nclimate1451>

. This was a shocking article that reveals, as of 2012, our use of renewable energy is not actually waning us off of our fossil fuel reliance but adding to it. A poignant realization no doubt, but perhaps could be used to enforce a more robust transition to a full renewable system instead of the current one in which extended extraction occurs with just a little bit of energy coming from low emission projects.

———. 2017. "Environmental Consequences of Moral Disinhibition." *Socius: Sociological Research for a Dynamic World* 3: 1–8. <https://doi.org/10.1177/2378023117719612>

. This article was a follow up to Professor York's fossil fuel displacement article and helped me formulate a better understanding of a specific element of our current issue. My concern now being if we start actually displacing fossil fuels will that lead to an increase in moral disinhibition? Thus repeating old mistakes just powered by wind and solar.

Zehner, Ozzie. 2012. *Green Illusions*. University of Nebraska Press

. This book was used as my initial investigation into what the ecological costs of renewable energy looks like. I used many of the references in this book to further explore what that cost actually is. There are some really good solutions made at the end as well that are socially based and not reliant on a technological breakthrough.

Habitat for Hope

Habitat for Hope is a living installation that embodies my fears and concerns but also my cares and devotions. This place reflects the larger world around us, as well as my own growing evolution within it. It is influenced by artists who work with the land, social issues, installation, phenomenon and landscape, and is also contextually driven by a contemporary crisis that I've come to discover through various authors and journalists.

It offers an unadulterated view of the global catastrophe of climate change, by distilling down what I believe to be some of the major tumors of a healthy climate into a more approachable size. This piece is simultaneously supposing a more hopeful future that not only doesn't overwhelmingly run on carbon and protects and preserves its natural resources, but also develops a greater sense of care and enjoyment for the nonhumans of the planet. By cultivating native plants of the Pacific Northwest and juxtaposing them up against extractive practices I am creating a place where pollution, profit and destruction fade into the past while care, stewardship and life usurp the status quo.

The garden site offers a gentle environment to take all that into consideration and reflect upon. The formal symmetry of the overall design operates as a meanderable mandala focused around a central location to look out of and center yourself within. *Habitat for Hope* offers atrocities within its atmosphere but its borders will always be breached by light and the life that it gives.

-Jeffrey Lippincott

PROPOSAL

jeffrey lippincott

Not Sold In Stores

Fall 2020

Thesis Instructor- Linda Wysong

Thesis Mentor- Linda Wysong

Jeffrey Lippincott
Not Sold In Stores
Fall 2020

“The clearest way into the universe is through a forest of wilderness.” John Muir. This quote was introduced to me during a month long trip on the Pacific Crest Trail and has always struck a chord with me because it felt so true. That trip rearranged a lot of my values and concerns and in a sense rearranged my position within the universe. Being completely immersed in the wilderness it becomes hard not to take notice and appreciate all the wonders, intricacies, and interdependencies of the natural world. Living in the 21st century it is also hard not to notice all of the ecological destruction that comes with our ‘advanced’ age. I have grown curious and concerned about industrial practices’ long term effects and changes with regards to the biosphere, such as rising temperatures, weather pattern intensity, ocean acidification, soil depletion, deforestation, species destruction, and value degradation.

In order to create experiences that promote a little more joy, laughter, relaxation and rumination, I propose to make a living installation in the form of a garden. I am intrigued by the concept of art as nature and using nature to create my art. I will collaborate with earth's autonomous occurrences to grow and shape, a 20’x10’ garden lot that includes objects reminiscent of industry. The goal of this juxtaposition is to provoke speculation of their relationship to the biological world and one's own relationship to them. These objects represent the totality of these industries, whether that be fossil fuel, tech or finance, wearing down the false cloying effect set forth by P.R. campaigns and corporate advertisements. “Often the false has a greater ‘reality’ than the true.” A.J Ayer.

I believe that through juxtaposition, new meanings or understandings can be achieved. John Akomfrah states in conversation about montage, “somehow when two opposites collide in this dialectical way some sort of synthesis is engineered or brought about and in that a new form, a new meaning or a new way emerges which you can chase at infinitum.” So by growing plants in and around their antithese (industrial encroachment) I will intrigue this synthesis.

For example the oil rig fountain, by distilling down that fossil fuel industry into a single object, working as a fountain, and showing it in all its disgusting glory within a garden I hope to show a larger picture; the industry (as the structure) the industry’s action (as the pump and fountain) and its relationship within a larger organism (the garden itself).

My research includes readings such as Timothy Morton's "Hyper Objects," and documentaries such as Sofia Pineda's "Endgame 2050," and Louis Schwartzberg's "Fantastic Fungi," these have all influenced my development and philosophies. Artists of personal inspiration I find to share a similar narrative. Such as Patricia Johanson and their integration of art, nature, the public and sustainability; Endangered Garden 1987. Alan Sonfist for the restorative nature of their work; Time Landscape 1978. Maya Lin's memorial works for their minimal appearance in contrast to their more heavier content; Vietnam Memorial 1982. Most of my recent work has been largely influenced by the more phenomenological works of Robert Irwin and Olafur Eliason. Not particularly any one specific piece of theirs but more the philosophies of their intent and approach. For me, both artist's notion of making one simply more aware of the world and their perception has been a big influence. I admire the simplicity of Irwin's approach in comparison to the more grand notions he presumes, whereas I find Eliason's work to be in a similar regard but with a more direct approach; whether that be to perception, phenomena, or ecology. It is my hope that my site will share similar attributes to many of the things I enjoy about these artists and their works.

My proposal is to build a 20'x10' garden outside with four separate lots and an area for a small congregation in the center. Within these lots will be a variety of native plant species (from ferns, shrubs, trees, ice plants and flowers) growing from not only the ground but also out of objects such as PVC pipe, a computer, a briefcase, a wifi router, and a tractor. There will also be two fountains and a separate water component acting as a compass.

My process is experimentation and light labor. All my projects begin as an idea or mental image that is tested through labor, previous knowledge, and application. Oftentimes one project will lead into another or an aspect of one will be pulled out and explored creating a whole new project of its own. I enjoy projects that have projects within them and through a chiseling effect something gets finished.

This project aims to inspire questions, not answers; questions about the nature of these industries systems, the values they hold, their omnipotent presence and effect on our world and our lives, the personal contribution/reliance upon them we all have, and personal actions possibly taken to combat or augment them.

Bibliography

“Alan Sonfist Studio.” n.d. [Www.Alansonfist.Com](http://www.alansonfist.com). Accessed September 26, 2020.

<https://www.alansonfist.com/>. Alan Sonfist is a land artist whose work often consists of restoration, human interaction with the environment, and ecological awareness. His pieces are rich with a natural history of the land in which they live and bring new life to the once lush biological world around them. I really enjoy his dedication to the lands which his work occupies and hope to incorporate some of the qualities of his practice into my own.

Bishop, Claire. 2005. *Installation Art*. Routledge.

Clair Bishop is an art historian, critic and professor of art history in New York. Chapter two reconfirmed my affiliation with a more phenomenological approach to installation (probably why I like Maya Lin so much) and chapter one began to give me a different approach. I like the idea of creating a ‘dreamspace’ and the attributes of exploring a dreamscape. This really helped me visualize the garden I wanted to make; a cranked up “wheel of associations” with this very enjoyable, paradoxical plethora abound.

City of Portland. 2016. “PORTLAND PLANT LIST.”

https://www.portland.gov/sites/default/files/2018-12/Portland_Plant_List_2016_Update_Final2.pdf. This is a native species list of indigenous plants known to grow in the Portland area. This is a great source for finding out what plants will grow well in my garden while also being ecologically conscious.

Finkelpearl, Tom, and Vito Acconci. 2001. *Dialogues in Public Art : Interviews with Vito Acconci, John Ahearn ...* Cambridge, Mass.: Mit Press.

Tom Finkelpearl is an American Arts promoter, a former director of the Queens Museum and former commissioner of the New York City Department of Cultural Affairs. The interview with him and Maya Lin is what really stood out for me in this book. The way Lin describes her work in regards to the kind of ‘anti-monument’ and specifically her investigation into the relationship of the environment and 21st century technology. This began to formulate a better understanding of the space that I think I am trying to create.

Gravitas Ventures. 2018. “The Gardener.” Amazon.

https://www.amazon.com/Gardener-Frank-Cabot/dp/B07DJD29YR/ref=sr_1_2?crid=WA

[MVA88I5G3O&dchild=1&keywords=the+gardener&qid=1605720220&sprefix=the+gard%2Caps%2C266&sr=8-2](https://www.youtube.com/watch?v=MVA88I5G3O&dchild=1&keywords=the+gardener&qid=1605720220&sprefix=the+gard%2Caps%2C266&sr=8-2)

This documentary looks at the les quatre vents garden that Frank Cabot has designed in Quebec, Canada. I really enjoyed the way he talks about how a garden is supposed to function and how one should experience it. He talks about how gardens are not a quick gratification and how you should listen to what a garden is saying to you, not what you want a garden to be.

Guthrie, Michelle. 2018. "Ways of Knowing, Native Plant Car Rooftop, Native Plant Bicycle Garden." BFA Thesis, Pacific Northwest College of Art.

https://media.pnca.edu/system/assets/12fa6102-64f6-4fc8-b526-a73ca5e68660/original/pnca_12fa6102-64f6-4fc8-b526-a73ca5e68660_original.pdf?1533336211.

Michelle Guthrie is a PNCA graduate who explored a life-long connection to the land she grew up in culminated in this body of work that connects the land to the community in which she lives. This work taught me a lot about moss and inspired my own investigation into it while helping me develop my voice within my own writing. The resources she mentions and cites have been an interesting and insightful place to explore as well.

Hanley, Sarah Kirk. 2011. "Ink | The Lexicon of Tomorrow: Print-Based Installation." *Art21 Magazine*. April 8, 2011.

<https://magazine.art21.org/2011/04/08/ink-the-lexicon-of-tomorrow-print-based-installation/#.X1OxfmdKhE7>.

Sarah Kirk Hanley is the executive director of the Manhattan Graphics Center and has been in the print world for over 20 years. From 2009-2019 she was a critic and consulting expert in NYC and prior to that she was assistant vice president of Christie's print department. This article helped me contextualize some of the installations that I make, and I think has shown me that I like installations in public spaces because they act sort of as a social experiment, in a similar sense to Swoon whose main subject is the people who inhabit the spaces. I also found Mathew Day Jackson's work intriguing for the metal picture painted through multiple images revolving around a similar notion.

Hawken, Paul. 2017. *Drawdown : The Most Comprehensive Plan Ever Proposed to Reverse Global Warming*. New York, New York: Penguin Books.

The Drawdown folks are comprised of 70 individuals spanning across 22 countries, half of which have PhDs and the others at least one advanced degree. This book looks at the 100 most beneficial sustainability projects that are currently underway and on the horizon. It analyzes their cost efficiency in terms of dollars and ecology. This is a very uplifting read that provides a solid foundation for a new world with nature at the forefront.

Journeyman Pictures. 2016. "Bhutan: Height of Happiness?" *Amazon*.

https://www.amazon.com/Amazon-Video/b/?ie=UTF8&node=2858778011&ref=_nav_cs_prime_video

This is a wonderful documentary about Bhutan and its citizens. It begins with an overview of some of their core values (Gross National Happiness, Buddhism, Community) and how the wave of western ideals have been encroaching on their way of life since they allowed television into their country in 1999. It follows the societal destruction that that has caused and how they are coping and combating.

King. 2018. "How to Make a FLOATING Fountain." YouTube Video. *YouTube*.

<https://www.youtube.com/watch?v=EboJj8xv0Wo>.

"Kiss the Ground." 2020. *Netflix*.

<https://www.netflix.com/watch/81321999?trackId=13752289&tctx=0%2C0%2C3f93a10f6ec2d0fa5ed977ec6d09806a24236a40%3A440786a4a73f0c4d52e383394563a53335adc19c%2C3f93a10f6ec2d0fa5ed977ec6d09806a24236a40%3A440786a4a73f0c4d52e383394563a53335adc19c%2Cunknown%2C>

This documentary talks about how to regenerate our soil as a way to sequester carbon into the ground and reduce our emissions output. Coupled with other progressive farming techniques such as no till farming, pasture grazing, and proper composting. It is a very positive and optimistic look at what we are currently doing to combat our carbon output.

Klein, Naomi. 2014. *This Changes Everything : Capitalism vs. the Climate*. New York: Simon & Schuster Paperbacks.

Naomi Klein is a Canadian author known for her criticism of corporate globalization and capitalism. This book is helping better understand the more clandestine, systemic voice against climate science and economic change; and how our current system and values are designed to augment ecological destruction. Perhaps not overtly direct (although in some

cases it is) but equally damaging nonetheless; the externalities of capitalism. (Klein 2014, 1–123)

Kwon, Miwon. 2004. *One Place after Another : Site-Specific Art and Locational Identity*. Cambridge (Mass.) ; London: The Mit Press.

https://monoskop.org/images/d/d3/Kwon_Miwon_One_Place_after_Another_Site-Specific_Art_and_Locational_Identity.pdf. Miwon Kwon is the chair of the department of art history at UCLA. Her study focuses on land art and site-specificity and accompanying artists. This book covers the history of site-specificity and its current trends and trajectory and is helping me better contextualize aspects of my work within this scope.

“Little Sparta, The Garden of Ian Hamilton Finlay.” n.d. Little Sparta. Accessed September 22, 2020. <https://www.littlesparta.org.uk/>.

Ian Hamilton Finlay is an English poet who moved to Pentland Hills in 1966 and began working on this garden that spans over 7 acres. This is a collaborative piece that draws on stone carvers, letterers, other artists and poets to explore themes of the natural world, ancient civilizations, the second world war and the French revolution. This has helped me develop a more clear mental vocabulary about how I want my garden to act.

Livinglandscape Nursery, 3926 N Vancouver Ave. Portland, Oregon. This is a native plant nursery in Portland and has helped me find out possible plants to use in my own garden.

Matilsky, Barbara C, and Art. 1992. *Fragile Ecologies : Contemporary Artists' Interpretations and Solutions*. New York: Rizzoli International.

This book looks at art history through an ecological lens, and talks about humans' connection to nature and how we have represented that through art over millennia. It then offers a multitude of sections about more contemporary artist practices that involve an ecological concern. This book has helped me formulate my own ideas about my connection to nature and the experience I want to make while offering tons of inspiring artists to seek out along the way.

Morton, Timothy. 2014. *Hyperobjects : Philosophy and Ecology after the End of the World*. Minneapolis: University Of Minnesota Press, [] Copyright. Timothy Morton is an English professor at Rice University and a member of the object oriented ontology philosophy movement. His work consists of OOO thought with a focus on ecological concerns. This

book expanded my perspective on the interrelationship of everything we do and make as humans and how that will inherently affect the earth in one way or another.

“Patricia Johanson.” 2017. Patriciajohanson.Com. 2017. <https://patriciajohanson.com/>. Patricia Johanson is a land artist who typically works in the public sphere. Her work often blends functionality, aesthetics and interaction in a very interesting way which I find most engaging about her work. I like how her pieces not only interact with the human environment but oftentimes the flora and fauna of the surrounding environment as well.

Prinz, Susanne. 1997. “Beyond Eden, The Art of the Garden or Art in the Garden.” December 1997. <file:///Users/jefflippincott/Downloads/Beyond%20Eden.pdf>.

This article helped me revalue my own garden and the work that I make that live in it. I used to think of them as separate but am beginning to see that they could all correlate to each other. This article made me think of a garden as a project itself. I like the meditative aspect, the organizational qualities, the time needed for things to grow, the actual growth of the vegetation itself, and they’re very inviting. “Art and nature are forced into a model mediation and reconciliation that aims to construct a harmony between them via a subjective nexus of meaning.”

Smithson, Robert, and Jack D Flam. 1996. *Robert Smithson, the Collected Writings*. Berkeley: University Of California Press.

https://monoskop.org/images/a/ad/Smithson_Robert_The_Collected_Writings.pdf.

(Smithson and Flam 1996, 10–23)

This reading has helped influence ways in which I see aspects of my own project and helped develop a more clear language about those functions. It has introduced me to new and inspiring artists such as Will Burtin and A.J Ayer while giving me confidence in the work I am making.

Sullivan, Laura. 2020. “How Big Oil Misdemeanor The Public Into Believing Plastic Would Be Recycled.” NPR/OPB. NPR. September 11, 2020.

https://www.npr.org/2020/09/11/897692090/how-big-oil-misdemeanor-the-public-into-believing-plastic-would-be-recycled?utm_campaign=npr&utm_term=nprnews&utm_source=twitter.com&utm_medium=social.

Laura Sullivan is a NPR investigative correspondent who exposes the reality behind many issues facing the world today. This is a fantastically disturbing article about big oils scheme to

make recycling look like an ecological savior to the plastic abundance when it was actually all a PR stunt. This article and others like it are generators for my thinking and the work that comes from it.

Tate. 2020. "Tate - John Akomfrah: History Matters." *Facebook*.

<https://www.facebook.com/tategallery/videos/251087979674003/>.

Akomfrah John is a British filmmaker whose work centers around historical criticism. His section on how montages operate was a compelling influence on my language development because I see a lot of similarities in how he speaks about montage with regards to how I see my objects within the garden.

Teem, John.

John Teem is a history and political science major with a degree from San Diego State University. He is currently working in Tunisia teaching history and english. Our meeting was actually right after I read Maya Lin's interview and it was mentioned to be a interesting concept to address industrialization's new 'green' concerns. And this began the ideas of using objects as soil bases to grow plants out of and use the dichotomy created to my advantage.

Upin, Cathrine. 2012. "Climate of Doubt." FRONTLINE. October 23, 2012.

<https://www.pbs.org/wgbh/frontline/film/climate-of-doubt/>

This is a documentary about the campaign to make climate change look like a hoax starting around 2009 and living with us today. It examines some of the theories of this caliber of person, and tries to explain how there is now a sizable percentage of the population who believes climate change is a fabricated story to limit "freedom" and push a hidden agenda.

Weschler, Lawrence. 2009. *Seeing Is Forgetting the Name of the Thing One Sees : Over Thirty Years of Conversations with Robert Irwin*. Berkeley: University Of California Press.

Lawrence Weschler is an author focusing on creative nonfiction and was a staff writer at The New Yorker for over 20 years. He has been following Robert Irwin since the 70's, and this book was my first introduction to a more phenomenological approach to sculpture and began my focus on installation. I became interested in the act of perceiving through this book and trying to make minimalist structures and sculptures that provoked a heightened awareness.

Worth, Katie. 2017. "Democrats Condemn Climate Change Skeptics for Targeting Teachers."

FRONTLINE. This was a follow up article that I read about the heartland institute. They were introduced to me through the "Climate of Doubt" documentary and I wanted to see what riveting work they have been up to recently. April 12, 2017.

<https://www.pbs.org/wgbh/frontline/article/democrats-condemn-climate-change-skeptics-for-targeting-teachers/>

Zuboff, Shoshana. 2019. *The Age of Surveillance Capitalism the Fight for the Future at the New Frontier of Power*. PublicAffairs.

Shoshana Zuboff is a professor Emerita at Harvard Business School Faculty Associate at the Berkman Center for Internet and Society at Harvard Law School. This book is an in-depth look at how big tech companies (Apple, Google, Amazon, Facebook) have reached the point of massively profiting off mining individual's personal data. This has been an interesting book so far for its look at our economy in relation to our values and their clear overlap. Specifically when she quotes Joseph Schumpeter, an evolutionary economist, writings on economic mutation. The only way for an economic mutation to stick is by new consumer needs, she gives example of the Apple revolution. This coupled with Naomi Klein's *Capitalism vs. Climate* makes an interesting case for the need for a new economic mutation; one in which consumers lay heavy importance on ecological sustainability. (Obviously it's not that clear cut but nonetheless an imperative part of the change desperately needed). (Zuboff 2019, 1–62)