The Clean Development Mechanism and Carbon Enclosures

By

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Abstract

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This thesis examines the role the Clean Development Mechanism (CDM), an offsetting mechanism introduced by the Kyoto Protocol, played in facilitating carbon enclosure in the global South. The research focuses on the CDM as a case study, which connects a range of actors and disciplines in the service of decarbonization. The research in this thesis is both descriptive and explicative, comparing dominant assumptions about market environmentalism with critical political economy perspectives. The research, and this thesis, shows that the CDM's characteristics as a tool for capital accumulation resulted in uneven distribution of projects and green enclosure.

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Mom and Dad, words cannot begin to describe how much I love you and how you helped me through this. You raised me to have scruples. I hope that comes through.

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Chapter One – Introduction

The February 2018 Winter Olympics in PyeongChang, South Korea marked the 23rd time that more than half of the planet's nations were represented in one city. Dubbed the "Peace Olympics" by international media outlets, the 2018 Olympics were notable for having North and South Korea participating under one flag for certain events. While this cooperation may have garnered significant news coverage, one story in particular went largely unnoticed: the PyeongChang Olympics generated 1,590 kilotons of greenhouse gases (GHGs) (Mabee, 2018). Compared with the 2010 Vancouver Olympics, which generated 278 kilotons of GHGs, the increase in GHGs was noticeable (Mabee, 2018). The International Olympic Committee (IOC) had two concerns with emissions generated by the games. In the short term, the IOC wanted to ensure that the games generated the smallest amount of GHGs possible, but in the longer term, the IOC worried that climate change may make the Winter Olympics impossible in some parts of the world. A *New York Times* report found that 9 of 21 cities that have hosted the Winter Olympics will be not be reliably cold enough to host the Winter Olympics in just 25 years (Pierre-Louis & Popovich, 2018). In fact, the last two Winter Olympics, held in Sochi and Vancouver, would no longer be possible in those locations given the temperature projections. These fears increased the pressure on the PyeongChang organizing committee to mitigate environmental impacts for 2018. How did the PyeongChang organizing committee then deal with the emissions impact, knowing that the expenditure of energy would be significant? The preferred method was to make use of carbon offsets sanctioned by the Kyoto Protocol. Before the games started, the organizing committee secured offsets to ensure 84 percent of the emissions activity at the Olympics could be considered "carbon neutral" (Mabee, 2018). The specific offset purchased by the committee was the Certified

Emission Reduction (CER), a carbon credit generated through a UN program created under the Kyoto Protocol (Mabee, 2018).

It is reasonable to expect international events with the profile of the Olympics to take climate change mitigation seriously, especially when the IOC may have fewer sites to choose from in the near future and especially when air travel is such a large GHG contributor to the event (Mabee, 2018). Preventing climate change requires an immediate and drastic reduction in GHGs. However, humanity is still hurtling towards a future where the global average temperature will rise above 2ºC before 2100, with little chance that we will remain below that threshold (Raftery, Zimmer, Frierson, Startz, & Liu, 2017). Even if Paris Agreement signatories succeed in achieving their stated emission reduction goals, those goals commit us to at least a 3ºC increase in global temperatures, according to a UN audit of the pledges made by signatories (Greshko, 2017). Other strategies to combat climate change are equally as bleak. Even if the globe ceased the burning of fossil fuels today, the physical properties and lifespan of CO_2 in Earth's atmosphere and oceans would likely commit us to a global temperature rise of close to 2ºC before the year 2100 (Mauritsen & Pincus, 2017). Despite the urgency, efforts to bring down emissions in rapidly growing economies like China, the world's largest GHG emitter, have been frustrated by increasing demand for electricity. In 2017, for example, China's emissions grew as a result of the exponential need for electricity, alongside the country's heavy reliance on coal to generate that electricity (Bradsher & Friedman, 2018).

Efforts to reduce emissions globally may have slowed their increase somewhat, but measured amounts of carbon continue to increase in the atmosphere, worrying scientists that natural carbon sponges (such as forests and the ocean) have reached an absorbency limit (Gillis, 2017). This suggests that the ability of our forests and oceans to absorb CO_2 in the atmosphere created by anthropogenic activity is waning. William Sweet, a journalist and lecturer at New York University, points to a study published in *Nature* which suggests that holding global temperature averages below 2ºC is effectively unachievable (2016, p. 7). Sweet also points to the former Executive Secretary of the United Nations Framework Convention on Climate Change (UNFCCC),[1] Yvo de Boer, who argued that the only way to avoid an average global increase in temperatures of 2ºC would be to "shut down the whole global economy." (2016, pp. 7-8)

Shocks and Stresses

A 2ºC increase in global temperatures will have wide-ranging negative effects, many of which may be hard to predict given the complexity of Earth's climate. The negative impacts can be delineated somewhat as "shocks" and "stresses" that will put new pressures on human health and wellbeing (Taylor, 2017, p. 351). Climate shocks can be categorized by high intensity storms, droughts, floods, and heatwaves that take place more frequently and with greater force than usual. Flooding events and droughts, for instance, would become more widespread and intense, while tropical cyclones would be stronger and their range and season would expand. There is some evidence that these supposed climate shocks are already increasing the strength of adverse weather events. In 2017, for example, the Atlantic hurricane season cost $202.6 billion USD in damages, earning it a reputation as the costliest hurricane season on record among disaster modellers. Similarly, 2017 storm damage globally exceeded $360 billion USD (Sullivan,

[1] The UNFCCC is the global treaty signed by more than 150 countries at the 1992 *Rio Summit* (Newell & Paterson, 2010, p. 197). The treaty is designed to set out a global framework to combat change, boasting an objective of stabilizing GHGs to atmospheric levels that would prevent "dangerous anthropogenic interference" with the climate (Newell & Paterson, 2010, p. 197).

2017). Meanwhile, the National Oceanic and Atmospheric Administration (NOAA), a U.S. government agency dedicated to monitoring weather and climate trends, found that 2017 was the most expensive year for U.S. weather-related disasters with $306 billion USD incurred (Mooney & Dennis, 2018). 2017’s hurricane season also broke a tropical rainfall record thanks to Hurricane Harvey and produced Hurricane Irma, which maintained Category 5 strength for 37 hours, breaking the previous record set by Typhoon Haiyan (Sullivan, 2017).

Warming climates often portend greater damage than purely weather-related incidents. For instance, Russia’s Yamal Peninsula was hit with an outbreak of anthrax in the summer of 2016. Russian officials hypothesized that an unusually warm summer in the high arctic region had thawed a reindeer carcass that had been previously infected with anthrax (Doucleff, 2016). A child died from the infection and after dozens more people were infected, the Russian government decided to evacuate a number of families from the region (Doucleff, 2016). The officials assumed that the reindeer in question had been dead for decades, but scientists suggest that some bacteria can live for millions of years in permafrost (Fox-Skelly, 2017). As such, people who had died in the high arctic or at high altitudes before diseases like smallpox were eradicated, could become bacterial time bombs as the climate warms and their bodies thaw (Fox-Skelly, 2017). This poses an increasing danger to humanity, where pathogens hidden beneath the ice could be unleashed as the Earth warms, potentially wreaking havoc on public health.

Building on these climate shocks, climate stresses are issues that pose problems for communities over the long-term as sea levels rise, tropical glaciers disappear, and deserts encroach on arable land. According to NOAA, 2017 was the hottest year in at least 1500 years in the Arctic (Joyce, 2017). The previous hottest weather record was in

2016, just one year earlier (Joyce, 2017). Arctic warming and diminishing ice caps mean that less of the sun's radiation is reflected back into space, meaning that while global temperatures increase, ice cover decreases. This has rippling effects on the rest of the climate. On average, climate scientists have found that summers from 2005 to 2015 are much warmer than summers measured over the same period from 1951 to 1980 (Popovich & Pearce, 2017). Should the climate continue to warm over the 21st century, North American cities can look forward to their climates resembling those of warmer cities 850 km away and usually located to the south (Fitzpatrick & Dunn, 2019, p. 2). Warmer summers will have negative impacts on the population, causing strain on power grids and health-care resources as people increasingly suffer from heat-related illnesses. In response to Northern Europe's 2015 heatwave, a World Meteorological Organization (WMO) official noted that major global heatwaves in 2003, 2010 and 2015, appear to be occurring with greater frequency (United Nations, 2015). North America is no exception. In 2018, the summer heat in North America was responsible for at least 70 deaths in the province of Quebec (The Canadian Press, 2018). The global South also battles with aberrant heatwaves, such as the case of Karachi, Pakistan where a heatwave claimed 1300 lives (United Nations, 2015). According to the WMO, concentrations of GHGs in the atmosphere continue to increase, without signs that the trend will abate (WMO, 2019). This, of course, increases the risk of heat waves and a whole host of other catastrophic events related to global temperature increase.

Communities in the global South face particularly unique challenges related to a warming planet. In Peru, for example, their melting tropical glaciers pose serious risks to water security. The Cordillera Blanca ice cap, which provides water runoff, recedes by 30 feet annually as global temperatures increase (Casey, 2017). A massive Peruvian irrigation project that cost hundreds of millions of dollars to implement sees less and less water each year. Furthermore, receding glaciers expose heavy metals that had been buried under the ice for thousands of years. These heavy metals find their way into the water table, causing a myriad of negative health impacts (Casey, 2017). A similar issue confronts Arctic communities as permafrost thaws, leaching mercury into the local environment (Mooney, 2018). According to an inventory taken in the 1970s, Peru's glaciers have receded by 40 percent, an alarming statistic in a country where these glaciers provide a sizable majority of the drinking water (UNFCCC, 2014b). This trend of receding glaciers is not unique to Peru. In the past four decades, the world's 150,000 glaciers (excluding Greenland and Antarctica's) thickness has fallen by 21 metres (Fountain, 2019, p. A14). Close to a sixth of the Earth's human population relies on glacier runoff for drinking water and irrigation, the bulk of which reside in China and India (Cho, 2017). Karakorum and Himalayan water runoff feeds into the Indus, the Ganges, the Brahmaputra, the Yellow, the Yangtze and the Mekong rivers, supporting water supply for millions (Fountain, 2019, p. A14).

As water becomes scarcer and storms become worse, the brunt of these shocks and stresses are felt acutely in the global South, where southern communities lack the resources to confront these challenges (Taylor, 2017, p. 351). The United Nations High Commissioner for Refugees (UNHCR) continues to warn participants at global conferences on climate change that a warming planet has the potential to displace large sums of people. Although estimates may vary, the International Organization for Migration believes that climate change related migration could range anywhere from 25 million people to 1 billion people by 2050 (Brown O. , 2008, p. 12). These estimates may be corroborated through the examination of recent weather-related disasters, where in

2017, tropical cyclones in the Caribbean, droughts in East Africa and flooding in South Asia forced millions to flee their homes (UNHCR, 2017). As climate change migration occurs, it is often compounded by other challenges. For instance, the influx of displaced people can strain the resources of regions or countries that offer temporary settlement, often putting additional pressure on countries in the global South that are already under resourced. The transnational banking corporation HSBC assessed 67 emerging markets in 2018 and found that India, Pakistan and the Philippines are the most vulnerable to climate change and the violent weather events that follow rising global temperatures (Chestney, 2018). HSBC found that India is especially at risk, as agricultural yields could be reduced by increasing temperatures and falling precipitation amounts (Chestney, 2018).

Using Markets to Fight Climate Change: The Clean Development Mechanism

The dangers posed by the abundance of GHGs in Earth's atmosphere have motivated a cross-section of society to develop strategies to avoid the worst effects of climate change. The aforementioned PyeongChang Olympics made use of an offsetting system developed by the Kyoto Protocol to mitigate GHG emissions. This system received support from a wide and diverse range of states, people, businesses and organizations. The Kyoto Protocol was a very significant stepping-stone in global climate change policy, placing binding emissions reduction requirements on the global North (defined as Annex I countries in the text) while expecting "meaningful participation" from the global South (defined as Non-Annex I parties in the text) (Newell & Paterson, 2010, p. 190). Given this, the global North expected the global South to partake in the fight against climate change, where "meaningful participation" required Southern countries to help the global North in its emissions reduction efforts. Enter the Clean

Development Mechanism (CDM), one of three flexible mechanisms created by the Kyoto Protocol. The CDM and Joint Implementation (JI), along with emissions trading schemes, provided all Kyoto Protocol signatories a method by which they could participate, flexibly reduce emissions, or both depending on their status in the protocol text. Importantly, the essence of the Kyoto Protocol pivoted on wealthy countries placing a price on carbon to bring emissions down to safer levels.

Proponents of the Kyoto Protocol designed the CDM as an offsetting mechanism. Offsetting is the practice of reducing emissions in one location so that they do not have to be reduced in another. In other words, offsetting is the practice of negating emissions produced by human activity. Activity that creates GHG emissions in one place is offset by activity to reduce or limit emissions elsewhere. The offsetting process itself engenders complex engineering and accounting practices. Emissions are counted in tonnes of CO_2 reduced (or its equivalents). This is represented as tCO_2e (Newell & Paterson, 2010, p. 191). This unit of measurement allows emission reduction activities to be measured and quantified. By quantifying the emissions being reduced at the source, offsetting allows other entities to fill up atmospheric space with emissions. This means that offsetting can allow emitters of GHGs the flexibility to buy offsetting credits, which are units that essentially provide polluters with space to pollute.

While this may seem esoteric, the concept of offsetting has real world implications. Contemporary human existence relies heavily on the generation of GHGs, both for survival and wealth generation (Ervine, 2017; Paterson & P-Laberge, 2018). Given this, there are plenty of activities that project developers can engage in to qualify for emissions credits under the CDM. Since the CDM began registering projects in 2001, industrial gas destruction projects generated the largest number of these emissions credits amounting to around 46% (UNEP, 2019). These credits are dubbed Certified Emissions Reduction units or CERs. Interestingly, industrial gas destruction projects represent only 1.7% of registered projects (UNEP, 2019). These industrial gas destruction projects are a notable feature of North-South industrial relations, thanks to the Montreal Protocol (1987), which aims to cease the production of gases that destroy the ozone. In relation to industrial gas destruction, the Protocol allowed the global South to produce a potent refrigerant gas named HFC-23 until 2030. Developed countries in the global North cannot claim emissions reductions for destroying HFC-23 because the gas is a by-product of HCFC-22 (chlorodiflouromethane) manufacturing, an ozone-destroying refrigerant. Since the Montreal Protocol bars the global North from the manufacture of HCFC-22, Southern countries can continue to produce the gas until 2030 (The Economist, 2010). The Protocol provides the global South more time in phasing out HFC-23 production, an acknowledgement of the industrial costs associated with doing so. This is important because almost one-half of all CDM credits produced since the CDM's inception come from these types of industrial gas destruction projects. While HFC-23 does not harm the ozone layer, it does have a greenhouse gas effect many thousand times more potent than CO_2. By destroying this gas, project developers negate its effect and qualify for credits corresponding to the greenhouse effect of the gas. When CDM project developers prevented the emission of one tonne of CO_2 they would qualify for one credit under the CDM. The project developers that prevent the emission of a tonne of HFC-23 would therefore qualify for many thousand times that amount of CERs.

Not all projects depend on modifying industrial processes to reduce emissions. Another large portion of CDM projects come from avoiding emissions. Around 20 percent of all CDM projects are hydroelectric based (Koo, 2017, p. 869). Hydroelectric power, as an emissions mitigation tool, is expected to overtake industrial gas projects by 2020 (Koo, 2017, p. 869). Hydroelectric projects qualify for the CDM because they generate electricity from waterpower rather than from sources that emit GHGs. Project developers must estimate how much CO_2 their projects would eliminate over the project's lifespan. This means that the project developer must determine how their hydroelectric project would eliminate the need for a power plant that might use fossil fuels to produce electricity. Another possible CDM project relies on project developers distributing fuel-efficient cookstoves to locales in the global South. Cookstove projects often replace stoves that require a relatively high input of fuel or biomass with ones which require less fuel. This entails a smaller output of GHGs in the process, requires less wood, and can help to reduce cases of localized deforestation. Like hydroelectric projects, cookstove projects must estimate how the distribution of fuel-efficient technology would reduce emissions against as business as usual scenario (BAU). Of course, these projects only make up a small percentage of all CDM projects, numbering at 42 out of over 8000 (UNEP, 2019).

Figure 1 (below) demonstrates how these processes work. Under a compliance emissions market, companies have their emissions capped at a specific level. If companies go over their limit, they must pay punitive fines to their respective jurisdictions. Compliance emissions markets, however, usually provide many opportunities to emitters to purchase excess credits from businesses that do not use up all of their emissions credits in a specified timeframe. That scenario is part of what is occurring in the A1 scenario in figure 1. The A1 firm has cut their emissions as per the regulations set out in the compliance emissions market. Scenario B1 on the bottom half of figure 1 is where the CDM plays a role. The credits emanating from CDM projects allow firms that cannot cheaply avoid emissions cover their expectations under a compliance market. This means the firm in section B1 can buy offsets to keep polluting as they were before the regulations came into effect. The impetus for businesses to buy up CDM credits is that they can often be acquired for less than the emissions credits as typically traded on carbon markets.

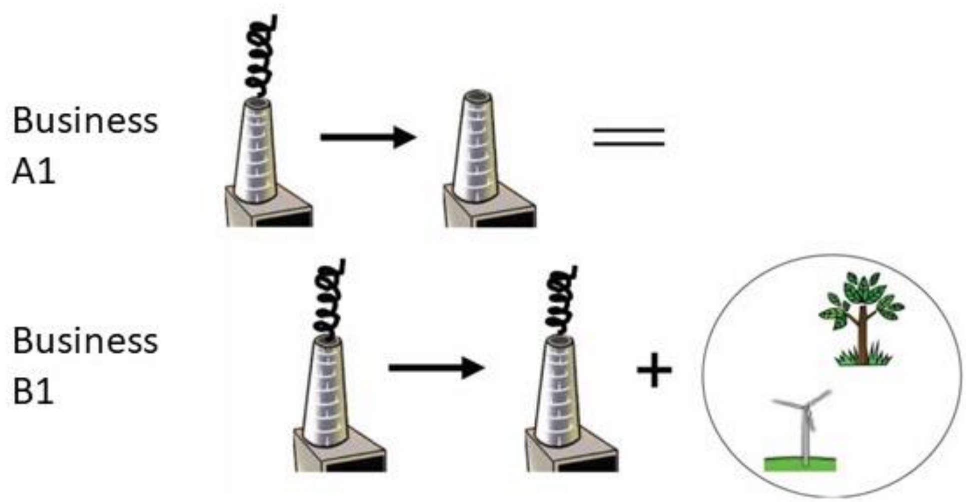

Figure 1 – The above diagram demonstrates how offsetting works in theory, where companies can continue to produce emissions after additional emissions reducing activities have been taken on elsewhere (Lohmann, 2010, p. 243).

Once projects successfully generate credits, after they successfully navigate the complicated approvals process, the CER is a financial product that can be bought and sold (Newell & Paterson, 2010, p. 191). This product also allows firms, businesses and countries to offset their emissions towards a goal of meeting requirements set out by international or regional accords, or to achieve carbon neutrality. Claiming to be carbon neutral however, means that the offsets purchased need to be of a quality where it is apparent that the emissions reductions are actually taking place. The-on-the-ground realties of offsetting projects are defined by a number of factors, such as the type of project being pursued and the socio-economic characteristics of the area hosting the project. Let us say, for example, that an investor wants to build wind turbines on the Ecuadorian coast. The investor has the majority of the capital necessary to build the turbines, but requires additional money to make the project financially viable. CDM financing could allow for the capital infusion necessary to enable viability. The investor obtains loans from interested parties, perhaps firms that want to offset their emissions in the global North, who would in effect be buying offset credits that could be sold on emissions markets sanctioned by the Kyoto Protocol or for the purposes of offsetting any emissions generating activity. Thus, investors are able to profit from the sale of carbon credits once the project they invest in begins to generate emissions. Consequently, the market also benefits as these projects generate cheap emissions offsets that provide firms additional flexibility in covering their emissions. Finally, the communities playing host to these projects benefit from the sustainable economic activities these projects are supposed to jumpstart. Parties who stand to benefit from CDM projects market them as win-win or triple-win scenarios, where theoretically everyone wins. This rhetoric is a trademark of market environmentalism and the CDM is no exception to this (Doyle & Chaturvedi, 2010, p. 522; Simon, Bumpus, & Mann, 2012, p. 276).

Assumptions made by public choice theorists (PCT), the dominant perspective within the UNFCCC, are that market environmentalism pays dividends to communities in the global South while allowing for flexible decarbonization in the global North. This has not happened, and this thesis uses critical political economy (CPE) to look at the CDM as a case study of how market environmentalism promotes uneven global distribution of projects, foregoes greener alternatives at project sites and promotes green enclosure.

Enclosure here being a process whereby capital moves into spaces that are not governed by the logic of capital and often violently deprives communities of commons. This process will be expanded on below. Global capital uses the CDM to reproduce itself and the result has been an offsetting mechanism that often immiserated communities playing host to CDM projects. Because the CDM is driven by project developers (at the ground level and at the UNFCCC), the overwhelming majority of projects are located in China, India and to a lesser extent Brazil and Mexico. These countries (in particular China and India) offered the lucrative HFC-23 projects described above, and they have produced the majority the CERs thus far. This resulted in an offsetting mechanism with extremely lopsided distributive characteristics, poking holes in arguments that the CDM could become a reasonable replacement for official development assistance (ODA). The environmental integrity of CDM projects and CERs produced at those sites are frequent targets for critics. Ervine cites a European Commission study which found that “85% of analysed projects, and 73% of CER supply that could be delivered through to 2020 ‘have a low likelihood that emissions reductions are additional and not over-estimated.’” (2018b, p. 113) CDM projects, however, are instead defined by instances of emissions accounting difficulties, both on paper and in practice. For starters, the CDM contributed to the cratering of the price of carbon on the European Union Emissions Trading Scheme (EU ETS), the world’s largest emissions market at the time, through oversupply. Ervine points out “that the global carbon market, including existing ETSs and Kyoto offset mechanisms, was valued at $176 billion in 2011, while in 2017 its value is approximately $32.8 billion.” (2018b, p. 106) This ensured that emitters who otherwise would have found it financially advantageous to transition away from emitting carbon, simply paid cheap prices to cover their emissions.

Critics also rail against the CDM for enabling economic activities that reduced emissions in the cheapest possible way, eschewing projects that may have placed less pressure on the host environments. The market-based characteristics of the CDM therefore creates a “dual problem” as conceived of by Sharife & Bond (2012, p. 29), where projects often “amplify” existing problems that were festering before the CDM began while at the same forcing these communities to forego alternatives that may have placed less pressure on the communities hosting the projects. One example is the Puerto Chivos CDM project in Mexico. This CDM project operated in such a way that project developers would only benefit financially if the local community disposed of their organic waste in the local landfill rather than choosing composting options that are arguably more environmentally friendly and could increase local employment (Lohmann, 2017, p. 7). The project developers had to “invalidate” other methods of waste disposal because it needed to instill property rights over the methane producing content in the community’s refuse to generate income (Lohmann, 2017, p. 7). Projects can also reinforce economic imbalances and environmental racism by financing installations like landfills, much as the CDM did in the case of the Bisasar Road installation in South Africa (Bond, 2007, p. 9). Most egregiously, the CDM often generates negative outcomes for communities in close proximity to project sites. CDM project developers frequently employ environmental rhetoric to make their projects look more attractive to authorities, employing a “green” economic approach to environmental stewardship, placing natural capital alongside commodities (Ervine, 2018b, p. 159). The same rhetoric also empowers project developers to dismiss concerns about the impacts of the projects in host communities, which became one of the defining issues with the CDM. As a product of neoliberal environmentalism, the CDM generated new avenues for profit. To be explicit, the CDM encloses on atmospheric space, creating tradable property rights out of thin air, thereby privatizing the sky. This process also takes place at the project level where commons, crucial to the social reproduction of many already vulnerable people in the global South, become targets for green enclosure.

Methodology

This thesis relies extensively on documentary analysis to inform its conclusions. While the Kyoto Protocol created the CDM in 1997, scholarship on the CDM projects themselves rapidly proliferated once the Kyoto Protocol took effect. The CDM is unique in that scholars examining it need to consider international relations, international economy, accounting practices, environmental sciences and anthropology, among other disciplines. The CDM connects a range of actors and disciplines in the service of decarbonisation, as its progress since becoming a keystone of the Kyoto Protocol has captured the attention of those interested in carbon pricing. As such, the vast majority of research in this document engages in a systematic review of peer-reviewed journal articles, monographs, scientific reports, journalistic sources and statements from a number of international organizations touching on market environmentalism and carbon offsetting. The research in this thesis is both descriptive and explicative, comparing PCT and CPE. This is all aimed at answering how the CDM's characteristics as a tool for capital accumulation resulted in uneven distribution of projects and green enclosure. It describes how the UNFCCC came to tout the CDM as its flagship flexibility mechanism, while explaining its motivations and consequences. The thesis examines how the market environmentalism of the CDM caused many host communities in the global South to experience a diminished standard of living.

Thesis statement

The literature review informs the arguments made throughout this document. It contends that the CDM is a product of climate change governance that is best understood through critical political economy. CPE contextualizes the CDM as tool for capital accumulation. It explains why the majority of CERs produced by CDM projects throughout its lifespan emanated from HFC-23 projects in a handful of countries. CPE also explains why alternatives to large industrial emissions reductions projects have not comprised a significant number of CDM projects since its creation. This document also puts a special emphasis on De Angelis' notion of enclosures to explain the dynamics of the CDM as a tool of capital accumulation, both on the level of offsetting generally and at the CDM project level. Industrialisation released unsustainable levels of CO_2 (and its equivalents) into the atmosphere, which has committed the globe to temperatures 1.5°C above preindustrial levels (Allen, et al., 2018, p. 51). This means that regardless of the actions taken in the near-term to deal with climate change, we will still need to grapple with decades of abnormal global temperatures until atmospheric greenhouse gas levels subside. Policymakers have been busy searching for methods to bring the production of human generated GHGs down to safe levels. Those methods have hewed close to market orthodoxy, favouring emissions trading and carbon commodification as a decarbonisation method, ostensibly because these decarbonisation methods favour flexibility. The resulting institution is one where investment in low-carbon transitions occurs when investors see the possibility for profit. Furthermore, these processes enable businesses to purchase cheap carbon credits while concurrently resisting meaningful restrictions on the industrial production of GHGs. Policymakers hoped the CDM would facilitate flexibility in reducing GHGs, which it may have succeeded in, but at a fatal cost to the CDM's credibility. Since it started issuing credits, the CDM helped to create a glut of carbon credits on carbon markets and was blamed for being a contributing factor in cratering the price of carbon, globally. Market volatility aside, the CDM is often detrimental to communities hosting the projects. Investment usually targets projects that can produce the most CERs as quickly as possible without much regard to the social and environmental consequences. The CDM has a tendency in certain cases to generate emissions credits of dubious integrity, imperiling emissions trading schemes' ability to reduce emissions, and operating with little regard to the input or wellbeing of host communities. These destructive characteristics are thanks to the CDM's creation as a tool of capital accumulation, opening up new spheres for capital enclosure under the guise of decarbonization. Decarbonisation methods with similar structures will generate the same outcomes.

Theoretical framework

The hypothesis of this document was derived from conclusions obtained in the literature review (refer to chapter 2). Proponents of flexibility mechanisms suggest that because markets will allocate resources efficiently, investors create CDM projects in locations where the maximum amount of credits can be issued for project activities. Of course, the propensity of CDM projects to generate credits regardless of the costs to the local environment and the communities living in close proximity to project sites can be detrimental. These project developers also employ discourses, which enable enclosure on commons. This means that this document approaches the CDM through a CPE perspective. CPE understands the CDM and its genesis through an examination of the structure of the global economy (Paterson & P-Laberge, 2018, p. 1). This acknowledges that the global capitalist economy "is an integrated system that has specific historical conditions of existence and specific organizing logics and tendencies." (Paterson & P-Laberge, 2018, p. 2) Those historical conditions of existence have their roots the industrial revolution, which entrenched fossil fuels as the engine of capitalist production (Ervine, 2018a, p. 696). This enabled a seemingly unlimited mobilization of resources, which concurrently allowed the rapid expansion of the capitalist economy (Paterson & P-Laberge, 2018, p. 2). A combination of deregulatory and neoclassical economic policies, which followed a number of economic crises in the late 1970s, hastened the movement of resources and capital (Ervine, 2018a, p. 696), stoking economic growth while worsening inequality and increasing the emission of GHGs (Klein, 2014, p. 81; Paterson & P-Laberge, 2018, p. 3).

The CPE approach to understanding the economy differs from public choice theory (PCT) which positions itself within neoclassical economic orthodoxy (evolving somewhat from "Smith, Ricardo et al.") (Paterson & P-Laberge, 2018, p. 1). PCT assumes all actors, be they consumers, politicians, firms or states act rationally (Paterson & P-Laberge, 2018, p. 1). PCT assumes that the choices made by these actors are apolitical, done in the service of maximizing utility, much like actors would on a market, theoretically speaking. CPE, however, suggests that the political processes that underpin human existence are structurally different from hypothetical marketplaces (Paterson & P-Laberge, 2018, p. 1). CPE provides for a useful analysis of carbon pricing and the emissions trading schemes that have emerged in response to the climate crisis because it tries to understand the structures that allow their provenance. The CPE perspective argues that these policy instruments and "their selection, design, and operation" is a political decision (Ervine, 2018a, p. 696). Furthermore, CPE argues that "the material and energetic foundations of modern industrial capitalist society – the state forms it produces, the dependencies it generates, and the power relations it gives rise to – are constitutive of dominant modes of governance that seek to respond to global climate change.” (Ervine, 2018a, p. 696) Coalitions of support for emissions trading overwhelm calls for regulations forcing emitters to stop producing GHGs because PCT orthodoxy suggests markets achieve these reductions with minimal disruption to the economy. Emitters close ranks behind emissions trading, as they understand it means minimal disruption to their business activities and because their participation in market-based systems allows them to suggest they are active participants in the fight against climate change.

In contrast to PCT, CPE draws heavily on the writings of Marx to inform its critique of capitalism and the climate crisis (Paterson & P-Laberge, 2018, pp. 1-2). Central to capitalism is the necessity for self-sustaining growth and profit maximization (Ervine, 2018b, p. 37). Given that capital requires constant growth to satisfy its imperatives, it also necessitates a constant energy input to ensure continuous production levels. CPE suggests that this requirement engenders specific political and social outcomes, including persistent inequality, propensity towards economic cycles of rapid growth followed by rigid contractions and the imperative of capital accumulation (Paterson & P-Laberge, 2018, p. 2). David Harvey argues that capital constantly needs something outside of itself to grow (Gutiérrez, 2011, p. 641) or it faces death[2] and CPE argues that the state facilitates this process (Paterson & P-Laberge, 2018, p. 2). To satiate

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[2] The grow or die imperative of capital has a double meaning. If a company within a capitalist system cannot grow, it will go out of business and die. The worker’s survival in this system is contingent on finding employment or risk going without food, shelter and the requirements for social reproduction. This means that both the firm and the worker grapple with the same choice between growth and death (Ervine, 2018b, p. 33)

this need, Harvey argues capitalist systems tilt towards scenarios where accumulation takes place through dispossession (Ervine, 2018a, p. 705; Samson, 2015, p. 815). This is where CPE argues that environmental commodification processes, like the CDM, often dispossess in order to commodify. The CDM commodifies atmospheric space to attempt to profit from the sale of CERs. The generation of this atmospheric space requires that projects engage in practices that had not previously taken place in these communities before. The CDM then affects common resources like local bodies of water, forests, and grazing land, often with the state assisting the process along the way (Samson, 2015, p. 815). As the alleged solutions to climate change, such as the CDM, often prompt negative outcomes for host communities and provide for unreliable pathways to decarbonization, CPE often maligns markets and market-based solutions as being unequipped to confront the climate crisis. As a result, CPE is sympathetic to the suggestion that capitalism is so interwoven with fossil fuels that only another political system can effectively manage the threat posed by climate change (Paterson & P-Laberge, 2018, p. 4).

In the vein of CPE, De Angelis suggests that a variant of Marxism that orients itself towards total system change may miss forms of resistance to programs like the CDM (Ervine, 2018b, p. 175). De Angelis’ theory of enclosure and commons suggests that at the community level, enclosure processes often meet resistance from commoning efforts. Since capital requires new spheres of growth on a perpetual basis, it is constantly looking for spheres not currently occupied by capital. De Angelis suggests that capital, as an unrelenting force, will attempt to colonize all “life worlds” in its own image until another force, in De Angelis’ words “socialised humanity,” pushes back on this process (2004, p. 67). Here “socialised humanity” could be labour unions, village councils, or community groups that find green enclosure through the CDM untenable. Waterways, hunting grounds and the air we breathe could all be considered commons. Any space that allows people to live their lives outside of the imperatives of capital can be labelled a commons. It is these so-called commons that also exist as targets for enclosure. De Angelis' theory of enclosures and commons encourages us to see "spaces within which the logic of capitalism can be challenged" (Ervine, 2018a, p. 705). Ervine contends that while many CPE adherents argue that total system change is the only way to stave off devastating climate change, ignoring resistance against commodification at local level may serve only to limit concrete, and tested, alternatives to capitalism (2018a, pp. 705-6).

Limitations of the study

This document focuses on the CDM as a case study of market environmentalism. As part of my studies, I attempted to conduct a field study on a CDM project in Quito, Ecuador, but because of lack of time and resources, I was not able to generate a data set that could provide for any meaningful conclusions on the success of the CDM project in question. Furthermore, the CDM case studies cited throughout this master's thesis do not, strictly speaking, provide for technical examinations of CDM projects. As the CDM requires project developers to provide estimates explaining how much carbon dioxide they hope to reduce throughout a project's lifespan, project developers must explain complicated engineering and accounting processes in the project design document (PDD). Much of the scholarship around the CDM focuses on technical minutiae, which, while important, often eschews questions around the CDM's ability to deliver on sustainable development and a project's interaction with host communities. Case studies in this master's thesis focus on the latter, which is to say the articles selected examine the socioeconomic characteristics of CDM projects. A special emphasis was put on those articles that problematized the CDM by investigating allegations of human rights abuses. While this document does use space to question the fidelity of accounting and engineering claims made by project developers, the primary focus of the case studies is on the communities that host CDM projects and their experiences therein.

The field research that was conducted in Quito was sanctioned by the Research Ethics Board (REB) at Saint Mary's University in Halifax. The interviews conducted followed the guidelines set out by the REB. Participants were able to decline proposed interviews without penalty and could refuse to answer proposed questions. Anonymity was granted if desired. All participants were thanked for their time and were told they would be provided with a copy of the thesis upon completion.

Structure of the thesis argument and conclusion

The proceeding chapter of this document will review literature unpacking market based climate change mitigation and the offsetting of emissions, which I will argue can be equated to selling the atmosphere to save it. This PCT perspective argues that neoliberal conservation strategies can help the environment while at the same time maintaining or increasing "demonstrably unsustainable economic trajectories" across the planet (McAfee, 1999). This has had widespread ramifications on climate change policy and the success of that policy to transfer needed finance to the global South. Chapter 3 will look at three scenarios that demonstrate the CDM's usefulness as a tool of capital accumulation. One is the disastrous admission of refrigerant gas destruction CERs onto the EU ETS, which helped to keep carbon prices well below the level necessary to ensure a financially functional CDM. Meanwhile, CDM financing has created an environment where projects and CERs registered by the UNFCCC incline towards countries like

China, India, and to a lesser extent Brazil and Mexico, while the least developed countries (LDCs) receive negligible amounts of CDM financing. This means that CDM financing is most often captured by countries whose economies are already experiencing significant growth and receiving investment. In addition, this chapter will focus on the CDM's propensity to be used as a method of exerting pressure over host communities and governments in the service of generating a return on investment. Given that project developers' main concern is recouping their investment, the drive to generate as many CERs as quickly as possible often generates conflict between project developers and local communities. Contractual obligations set out by PDDs can exert an excessive amount of control over project outcomes, while some countries will collaborate with project developers to ensure they can obtain the foreign investment. Project developers often fail to ensure that their investment will not preserve untenable social situations or upend the dynamics of the local community to the detriment of the most vulnerable. Finally, chapter 4 concludes this thesis by summarizing the document and by expanding on market-based climate change mitigation strategies being formulated in the shadow of the CDM.

Chapter Two: Literature Review

Offsetting emissions, the process that the CDM is based upon, combines the engineering, financial and accounting sciences to produce offsets that can be certified and sold across multiple jurisdictions and to multiple customers. The CDM produces the CER offset intended for use by compliance market participants to meet their required emissions cap, or those that want to offset emissions on a voluntary basis. Participation in the CDM meant that communities in the global South could host projects with the expressed purpose of lowering their own emissions so that market actors in the global North could purchase the right to pollute the atmosphere with their emissions.

The existence of the CDM as a form of climate change mitigation, insofar as a keystone of global climate mitigation policy, has its roots in American academia and American environmental policymaking. As I will explain below, the perceived success of emissions trading by powerful actors within the United States experience with emissions trading provided mainstream environmentalists with an example of emissions markets in advance of the Kyoto Protocol negotiations, where carbon markets became foundational to climate change mitigation. From this, the commodification of carbon, which in essence meant creating property rights for atmospheric space, allowing for enclosure of the atmospheric commons, became crucial in promulgating systems like the CDM. The CDM also enclosed commons on the project level, depriving communities of the resources they used for social reproduction. Beyond that, the CDM existed as a policy tool supported by a broad coalition of policymakers, capital markets participants, development experts, and environmentalists. Importantly, many in this coalition hoped to capitalize on the growth of offsetting as a means of climate change mitigation (through consulting on CDM projects, carbon market arbitrage and other forms of market profiteering). Moreover, entities that needed to meet emissions requirements on compliance markets appreciated the added flexibility enabled by CDM's existence

Evidence from over a decade of CDM offsetting shows that jurisdictions often produce a greater amount of emissions when accounting for offsetting, compared to jurisdictions that are do not adopt offsetting mechanisms (Checker, 2009). As such, this observation challenges the usefulness of the CDM as a means to limit emissions. Furthermore, the CDM's history as a flexible market based tool largely encouraged market actors to generate CERs as quickly and as cheaply as possible. Given this, projects that yielded higher amounts of CERs for a minimal investment had a better chance of implementation, thanks to the profit that could be generated. This is an important distinction, as higher CER production does not necessarily correlate with high levels of sustainable development outcomes at project sites. Building on this, low prices for CERs frequently preoccupied market participants since 2008. Lower prices for CERs means that the economic sustainability of CDM projects becomes tenuous. This has been the case since 2011 when prices for CDM offsets cratered on the UN market (Krukowska, 2019). Since then, market watchers have labelled the CDM a zombie market, as low prices essentially push the majority of projects into financial failure (Krukowska, 2019).

All of these issues are central to the CDM's foundation as a market-based offsetting mechanism. Public choice theory (PCT), or the "economic theories of politics," uses classical economic texts by Ricardo and Smith to explain contemporary political dynamics (Paterson & P-Laberge, 2018, p. 1), suggesting that market-based policy tools can best extricate the world from climate change. These theories seek to understand voters, politicians, and firms as "utility-maximizing agents," who will always act in their economic self-interest. Of course, in reality, none of these actors operate on perfect markets (Paterson & P-Laberge, 2018, p. 1). Therefore, it falls on critical political economy (CPE) to understand how markets work and why they receive considerable support as a policy tool. Specifically, CPE examines the operation of carbon markets, and the broader dynamics of global climate policy, within the context of global capitalism (Paterson & P-Laberge, 2018, p. 1). CPE points to the tendencies of capitalism, such as class conflict, economic disparity, capital's need to constantly expand, technologic and economic dynamism, the expansion of capitalism globally, the state's assistance in capital accumulation and the tendency towards economic crashes, as key barriers to a low-carbon future (Paterson & P-Laberge, 2018, p. 2).

In 2018, the IPCC stated that the globe has until 2030, a mere twelve years, to solve the climate crisis (IPCC, 2018). The global economy, by belching enormous amounts of emissions from fossil fuels into the atmosphere since the start of the industrial age, warmed the Earth's atmosphere enough that we are already feeling the effects. Earth's atmosphere essentially became a dumping ground for excess emissions, while fossil fuels powered a capitalist system, enabling the carbon-intensive transformations of economies, both in the global North and South. Once it became apparent that excess greenhouse gases (GHGs) in the atmosphere imperiled the capitalist growth agenda through ecological collapse, a societal response emerged to design policy that could extricate humanity from disaster. With this, specific coalitions of capital, capital here is being employed in the Marxian sense, sought climate mitigation schemes that would provide maximum flexibility in the transition to a low carbon economy so as not to upset economic growth. The CDM's early success as a flexibility mechanism lied in its ability to expose new spaces for commodification. The capacity for the CDM, and offsetting more generally, to ascribe polluting rights to atmospheric space represented the privatization of the atmospheric commons. This chapter will explain why that represents a potentially dangerous attack against the atmospheric commons and how the CDM imperils social reproduction in the global South. Before reviewing the CDM, it is important to explain the genesis of carbon pricing and to situate the chapter theoretically.

The History of Emissions Pricing

Privatization and pro-market policies transformed the U.S. economy in the 1970s, usurping state economic interventionism. These neoliberal policies emerged out of the "questioning of Keynesian regulation of capitalism." (Herrera, 2006, p. 40) Falling profit rates in the global North towards the end of the 1960s metastasised in the 1970s into an "open capitalist crisis, characterized by a swing of the whole system into monetary-financial chaos, exploding inequalities, and mass unemployment." (Herrera, 2006, p. 40) These policies push for a free market, free of government intervention, which proponents assume will allocate resources much more efficiently (Hunt, 1989, p. 316). Neoliberals also hold that consumers and producers are economically rational actors who always act in their best interests (Hunt, 1989, p. 297) and that states should aggressively pursue agreements that enable "unregulated international market activity." (Hart-Landsberg, 2006, p. 3) Herrera argues that at the national level, this entails "an aggressive anti-state strategy" which deforms "the structure of capital ownership to the benefit of the private sector," reduces "public spending for social purposes," and finally imposes "wage austerity as a key priority in fighting inflation." (2006, p. 41) Importantly, "Neoliberalism means the return to power of finance, that is, the most powerful (mainly U.S.) world capital owners." (Herrera, 2006, p. 40)

The rise of neoliberal policy in Washington coincided with an Environmental Protection Agency (EPA) market experiment in the US, designed to lower sulphur dioxide emissions in the northeast of the United States. The success of this early emissions trading scheme in reducing sulphur emissions without needing to tax emitters provided mainstream environmentalists with an example of emissions trading in advance of the Kyoto Protocol negotiations, where carbon markets became foundational to global climate change mitigation. In order to implement such a system, market actors needed to engage in the commodification of carbon, which in essence meant creating property rights for atmospheric space. While not entirely novel at the time, as the U.S. implemented emissions trading before it appeared in the Kyoto Protocol, the fact that signatories to Kyoto would attempt to implement carbon commodification on a global level marked the crossing of a significant barrier.

Policymakers in the U.S. began to look for ways to use markets to deal with environmental problems, as environmental groups began advocating for improved environmental protections in the 1960s and 1970s (Brown, Cloke, Gent, Johnson, & Hill, 2014, p. 246). It was here that technocrats saw the potential for markets. While the environmental movement began with so-called hippies and other radical countercultural movements in the mid-20th century, it quickly gained traction across a more moderate cross-section of American society. Environmentalists' later experienced some degree of success in pushing for environmental policy in Washington. For instance, President Richard Nixon signed the EPA into existence with an executive order, which Congress later ratified in the early 1970s. The EPA initially implemented command-and-control regulations, which consisted of technology or performance based practices and requirements (Aldy & Stavins, 2012, p. 154). The EPA's regulations, like the ambient air regulations forcing companies to decrease localized pollutants generated from industrial operations, were some of their first actions. These regulations forced industry to build smokestacks high enough to disperse sulphur dioxide (SO_2) and other noxious fumes, without affecting localized air quality (Schmalensee & Stavins, 2013, p. 104). Implementing command-and-control polices can incur heavy costs upfront. In the 1970s and 1980s, for example, acid rain preoccupied environmentalists and politicians alike for the potential impacts it could have on vegetation. The technological regulations designed to disperse localized amounts of problematic emissions, specifically the construction of tall smokestacks, ended up introducing SO_2 at altitudes that generated acid rain, particularly in the Northeastern United States (Schmalensee & Stavins, 2013, p. 104). Aldy & Stavins suggested that command-and-control regulations suffered from rigidity and heavy-handedness on part of the state (2012, p. 154). This is not to suggest that command-and-control policies were responsible for the onset of acid rain, but the regulations that ended up producing the acid rain provided critics with an opportunity to suggest that a more malleable form of regulating industrial processes was possible.

The search for less invasive emissions reduction policies, especially ones that would harness the free market to lower the emissions preoccupied policymakers. Aldy & Stavins assert that rigid, technological command-and-control requirements could not form the foundation of policy designed to lower GHG emissions given how common the production of GHGs are to economic activity (2012, p. 154) meaning that command-and-control policies would be too costly to implement across industry. This argument can provide some insight into why the U.S. government pursued other of policy options to reduce the level of SO_2 in the atmosphere. Command-and-control regulations as described above were an option. Policymakers could also implement emissions pricing schemes.

Policymakers thought about taxing the production of SO_2. Such a scheme would tax every tonne of SO_2 produced by a firm operating within a jurisdiction with that policy. Revenue generated from emissions taxation can be neutral, meaning that the government may use the proceeds to lower taxes elsewhere, further enabling jurisdictions with the support they need to create new taxes. Disadvantages, however, include the threat that firms will pass on the costs of the taxes to consumers, making them politically unpopular. Emissions taxation is generally the target of critique by neoliberals who feel that the prices are set arbitrarily by "inefficient government bureaucracies," which are sure to stifle growth (Ervine, 2018b, p. 80). Politicians also worry that firms will displace operations to jurisdictions with more liberal approaches to managing emissions.

Another option kicked around by policymakers was pricing emissions through a market scheme. This method seeks to harness the power of the market to reduce emissions through trading emissions credits. This idea gained traction in North American academic circles in the 1960s and 1970s. Lane asserts that economists "proved" that emissions trading schemes would offer cheaper pathways to reducing emissions by harnessing the efficiencies of the free market (2012, p. 585). These emissions markets would become economic orthodoxy almost overnight, as their underlying neoliberal ideology meshed well with the approaches taken by economics departments at influential U.S. universities (Klein, 2014, p. 81). These same public choice theorists advertised emissions trading as an apolitical tool that would harness the power of the free market, regardless of the political efforts needed to label these systems politically neutral (Spash, 2010, p. 178). However, many unanswered questions arose from theories around the use of emissions markets. For instance, following the collapse of the Kyoto Protocol, policymakers began to wonder how emissions markets could better incentivize participation (Paterson & P-Laberge, 2018, p. 5). Furthermore, often absent from discussions around emissions markets are how these markets can successfully reduce emissions. Regardless, pro-market proponents succeeded in framing climate change as a problem of state failure, requiring market-based intervention (Lovell & Liverman, 2010, p. 269). Furthermore, emissions markets, pre-implementation, represented a novel regulatory means of lowering emissions. Moreover, the U.S. already had a history of using capitalist markets to achieve conservation objectives, which further enabled the acceptance of these pricing schemes (Roth & Dressler, 2012, p. 364). Recycling programs, for example, relied on markets to sell recovered materials, thereby reducing the need for cost recovery (Strasser, 1999, p. 283).

As explained in the introduction, emissions trading places a cap on emissions being generated in a specific jurisdiction over a specific amount of time. Emitters, covered under an emissions market scheme, then have a limit on the amount of emissions they can produce in a given timeframe. These systems, more widely known as “cap-and-trade” systems, allow firms to lower their emissions within a period to sell excess emissions credits to firms that may exceed their emissions cap. As such, this system incentivizes the reduction of GHGs through revenue that firms could generate from the sale of emissions credits. Proponents argue this accomplishes two things. First, firms are able to maintain their outputs without having to reduce the emissions they produce, and second, innovative firms are able to generate revenue off the sale of emissions credits, a win-win scenario (Ervine, 2018b, p. 79). Pricing therefore acts as a tool, an apolitical “technology” that is readily available for governments being pressed to take some semblance of action on climate change (Simons & Voß, 2015, p. 54). Moreover, this system allows the economy to keep growing, an imperative of capitalist systems. The

Figure 2 below demonstrates how this system works when attempting to manage carbon dioxide (CO_2) emissions.

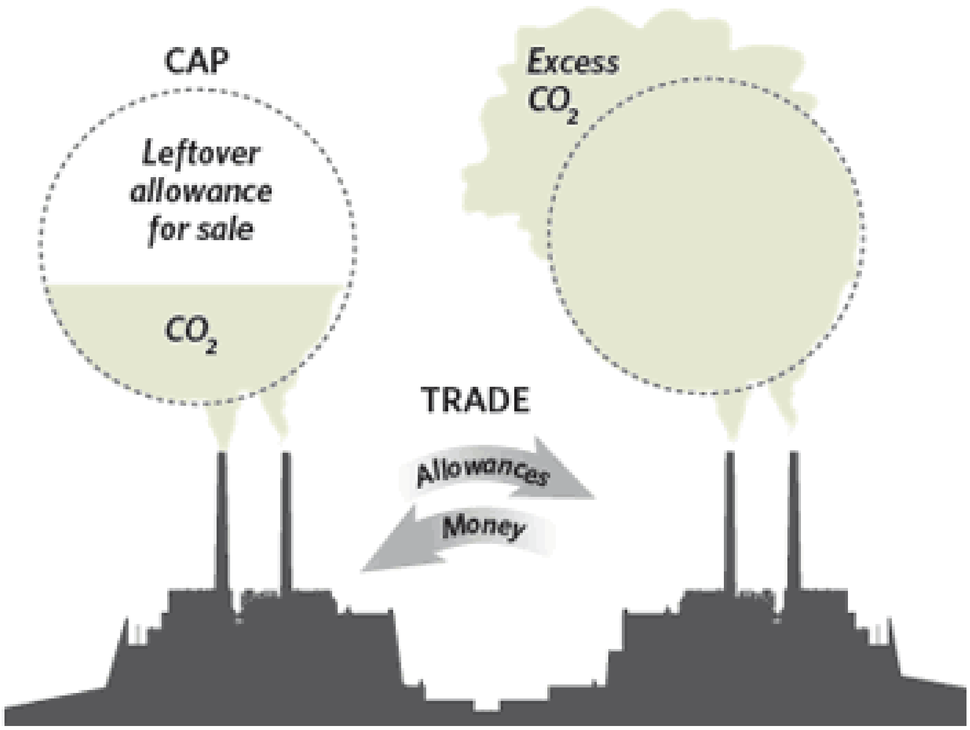

Figure 2. Cap-and-trade in theory. Source: McCormick, (https://www.mccormick.northwestern.edu/magazine/spring-2013/carbon-calculator.html) reporduced in Ervine, 2018b, p. 79.

The EPA initially attempted emissions trading by coupling it with command-and-control requirements in the Clean Air Act. When the hybridized regulations failed to deliver efficiency gains that would satisfy policymakers, the EPA introduced amendments to the Clean Air Act in 1990, which more closely resembled emissions trading as designed in university economics departments (Lane, 2012, p. 586). A SO_2 emissions trading system, introduced by the EPA in 1990, ostensibly helped to diminish SO_2 emissions in the U.S. (Simons & Voß, 2015, pp. 61-62). As referenced earlier, acid rain had become a major environmental issue. The EPA's SO_2 emissions trading program provided the policymakers with a good news story about the capability of markets. Following the implementation of the SO_2 market, the EPA saw a 67 percent reduction in emissions from covered sources (Tietenberg, 2013, p. 318). The market had the added advantage of breaking a policy impasse and fostering innovation among the businesses covered by it (Lovell, 2015, p. 111).

The success of the SO_2 emissions trading scheme was likely thanks to circumstances independent of the market itself. The coal being used by utilities in the Northeast United States contained high levels of sulphur. This created high-sulphur emissions, which generated high levels of acid rain. Rail industry deregulation in the 1980s freed up access to low-sulphur coal from Wyoming and Montana (Schmalensee & Stavins, 2013, p. 111), reducing the need for SO_2 market-covered installations to allocate resources to emissions credits (Schmalensee & Stavins, 2015, p. 6). While this coal did not produce as much energy, costs were such that following rail deregulation, burning it could still be cheaper than the coal that installations used before, even without the regulations set out by the EPA (Schmalensee & Stavins, 2013, p. 111). The SO_2 markets created by the Clean Air Act amendments showed that markets might not have had as much impact on emissions as some policymakers believed. The Northeast United States' early experience with emissions trading may have been different had it not been for the fuel underpinning the industrial processes in that part of the U.S.

Actual success of the SO_2 market notwithstanding, American climate negotiators were eager to implement similar frameworks globally to manage the climate crisis (Lohmann, 2010, p. 236). Following the success of the EPA's experience with their market solution to pollution, Washington was willing to support U.S. involvement in the Kyoto Protocol negotiations, provided delegates implemented a similar framework globally. Since delegates from other countries were "desperate" to ensure U.S. participation in the framework, they knew that the American demands needed to be heeded (Newell & Paterson, 2010, p. 27). As the world's lone superpower at the time, the economic clout of the U.S. made their participation in a climate change compact necessary for the sake of the compact's legitimacy. From the top down, the U.S. wanted emissions trading to form the foundation of a global compact on climate change mitigation. Bill Clinton went so far as to highlight the "profits" that could be generated from emissions trading as a key benefit (Ervine, 2018b, p. 83). The potential for profits certainly enticed segments of capital that held sway in Washington D.C. A collection of financial firms and oil and gas companies lent their support to carbon trading early on. British Petroleum were one of the first to consider lending their support to carbon trading (Ervine, 2018b, p. 83), but many companies in the resource sector marshalled considerable resources against any carbon pricing schemes. Sunset industries lobbies, such as coal and oil industries, are well known for lobbying against any restriction on fossil fuels (Newell & Paterson, 2010, p. 37; Matt & Okereke, 2014, p. 117; Paterson & P-Laberge, 2018, p. 2). Nevertheless, larger resource-based firms came around to participating in climate change mitigation frameworks, hoping that a seat at the table would help them avoid punitive carbon pricing by designing carbon pricing schemes that would serve "their economic interests." (Ervine, 2018b, p. 83) Those interests were of course implementing systems that would not stand in the way of their need to profit. Because fossil capitalism created powerful entrenched interests that resist change (Paterson & P-Laberge, 2018, p. 4), Ervine points out those interests sought out carbon trading schemes, which "promised minimal disruption to dominant relations of production and consumption." (2018b, p. 83) Not to be left off the proverbial negotiating table, financial capital supported emissions trading for a number of reasons. First, financial capital saw the potential for accumulation in facilitating the trade of emissions credits (Paterson, 2012, p. 88), but also for financial capital to “mobilize investment” into connected institutions, such as the CDM (Paterson, 2012, p. 91).

The PCT perspective is wholly supportive of carbon markets while CPE theory can be more complicated. Some CPE theorists suggest that the presence of financial capital in carbon trading schemes must demonstrate precipitous and continuous declines in emissions. That is to say that if financial capital is going to benefit from carbon market arbitrage, they must also demonstrate that their profiteering activities on markets leads to reduced emissions overall. CPE theorists like Newell & Paterson also worry that neoliberal ideology favouring weak regulatory institutions around carbon markets could create another “Enron” or “sub-prime-cum-‘credit crunch’ crisis” (2010, p. 142). Newell & Paterson suggest a climate Keynesianism approach seeks to reckon with climate change by treading “a much more central role for state planning, public deliberation, and re-regulation of the private sector” in the interest of significant and rapid decarbonization (Paterson & P-Laberge, 2018, p. 8). To Newell and Paterson these measures would include stringent regulation by government of ETSs and offsetting mechanisms to ensure a stable price of carbon and would stem profiteering on those markets while implementing tougher command-and-control policies to ensure greater levels of decarbonization (2010, p. 173). Anti-capitalist CPE theorists like Lohmann however question whether financial capital can override resistance to carbon markets in the interest of generating coalitions that look to decarbonize the economy. Lohmann argues that while financial capital may be able to generate profit from carbon trading, they will likely continue to lend to the fossil-fuel industry, thereby ensuring that industry’s continued growth (Lohmann, 2011, p. 656). Obviously, carbon markets are supposed to reduce emissions and theoretically speaking, this would (or should) reduce the exploration and production of fossil fuels. However, the criticism here is that a reduction in emissions and efficiencies gained from policy constraints on GHGs can generate more GHGs in the long term.

Lohmann also suggests the "learning by doing" approach favoured by policymakers on the EU ETS (attempting to use an untested system and fixing the problems later (Newell & Paterson, 2010, p. 31)) failed to resolve abuses on that carbon market (Lohmann, 2011, pp. 656-657). Lohmann cites the case of a Czech electricity company that sold away excess credits that were initially provided to the company for free, right when the EU ETS came into effect for a windfall of 187 million euros in 2005. The company then bought the credits required to be compliant with the ETS a year later when the price had fallen (Lohmann, 2006, p. 91). The Czech company later increased coal production in 2006 (Lohmann, 2006, p. 91). There are other examples of the EU ETS being excessively kind to industry in its early stages. The German utility RWE, one of the heaviest emitters of GHGs in Europe, received the estimated equivalent of US$6.4 billion in allowances in the first three years of the EU ETS (Spash, 2010, p. 177). The utility made well over 1 billion dollars at the start of the EU ETS when it charged its customers for the expenses they claimed they would incur from the EU ETS (Spash, 2010, p. 177). The philosophy behind providing a large amount of allowances to companies at the start of an ETS is to acclimatize the firms to operating under a compliance ETS. However, there is nothing preventing companies from selling off excess allowances, or from speculating on the price of carbon. By providing free allowances to these types of firms, German, British, Spanish, French and Italian companies operating under the EU ETS generated billions of euros in the process, while passing the supposed costs on to their customers (Carbon Market Watch, 2016, p. 4). Lohmann argues that profiteering off the

EU ETS like this reduced its legitimacy as a tool to reduce GHGs. While defenders of the EU ETS suggested that these sorts of issues were simply growing pains on a market where learning by doing would ensure fixes, improvements made after Phase I (2005-2007) were not sufficient to avoid a nosedive in carbon prices. This massive transfer of wealth to already very wealthy companies, without too much to show in the way of real reduction in emissions, leads Lohmann to argue (correctly) that the prognosis for the EU ETS is not positive (2011, p. 657).

The point of contention here is whether carbon markets can offer pathways out of the climate crisis. Paterson & Newell suggest that Lohmann's desire for an "ideologically pure position" on climate change governance (which in their minds is one of "total hostility" to emissions markets) fails to reckon with "the pursuit of decarbonisation for those interested in near-term change, including by actors with significant economic power to bring it about." (2012, p. 1172) However, Lohmann's repeated citations of carbon market failures justify his extreme skepticism of carbon markets. While Paterson & Newell point out that both they and Lohmann desire a world without fossil fuels and that climate change governance "within capitalist conditions, must contain some elements of capital to be viable," (2012, p. 1175) fossil capital is only interested in carbon markets because they place the mildest restrictions on its expansion. Lohmann states, quite simply that "Carbon markets are not about decarbonization; therefore they cannot enrol any faction of capital in decarbonization" (2012, p. 1177). Lohmann's argument is that carbon markets are measures that help carbon intensive sections of industry avoid making necessary changes. To support this charge, Lohmann cites the price slump of European Union Allowances (EUAs), the EU ETS's trading unit's from €30 to little more than €6 (2012, p. 1178). These prices are not sufficient to put pressure on covered firms to make substantial reductions in GHGs (Lohmann, 2012, p. 1178). Lohmann argues that at these prices, carbon trading schemes achieve little in the way of significant climate change mitigation and fail to curb fossil fuel exploitation (2012, p. 1178). Lohmann is correct in arguing prices generated by carbon markets are generally far too low to instill the desired transition away from fossil fuels. For example, Simon Fraser University's Mark Jaccard points out that carbon prices in Canada need to be closer to $250 per tonne of CO_2 in order to stoke a transition to renewable energy sources (Wilt, 2019, p. 32), far below what carbon markets have ever (or probably will ever) price carbon at. Carbon markets *can* help in decarbonization of the economy, but government has to be extremely diligent in regulating these markets, including setting stringent price floors for carbon prices. Of course, pricing carbon well above its current price would also likely be politically unsustainable, meaning that carbon markets cannot be cornerstone of a jurisdiction's environmental policy.

Carbon Markets and Capital

To understand how market-based carbon pricing became the cornerstone of the Kyoto Protocol, we need to examine how capital exists within markets. Carbon trading offers capital fertile ground to not only appear that it is doing something about the climate crisis, but also opens up new avenues to expansion through carbon market arbitrage. In addition, as I discuss in more detail ahead, carbon trading creates a professional class made up of engineers, consultants and entrepreneurs in the global South to capitalize on a new offsetting framework. Capital, Karl Marx argued, is the social relation that grows out of the production process. Capital is used to purchase the means of production, including Items like factories, fishing boats, web servers and privately owned telecommunication networks, just to name a few. Those means create commodities, which are then sold. After wage labour is compensated for their work, the surplus value is then reinvested in that process or kept as profit. Capital here is a social force that separates the labourer from the means of production (as opposed to Adam Smith's conception of it as a thing) where it is able to reproduce itself and repeat the separation process continuously (De Angelis, 2004, p. 65). Marx emphasizes the "'process of production…seen as a total, connected process, i.e. a process of reproduction, produces not only commodities, not only surplus-value, but it also produces and reproduces the capital-relation itself; on the one hand the capitalist, on the other the wage-labourer'" (De Angelis, 2004, p. 65). The separation of the producer, the means of production and the connection of the producer to other producers creates systems, which enable the reproduction of capital.

The system created here, punctuated by the "realization of profit," is the capitalist market (Ervine, 2018b, p. 32). The motivation driving the capitalist market is the promise of continuous profits, provided the system continues to produce. The *grow or die* characteristic of the capitalist market means firms must produce goods continuously and reinvest in the means of production to ensure ever greater production of goods for increased sales and thereby, greater profits (Ervine, 2018b, p. 32). Should the capitalist fail to compete on the market, they will go out of business and their workers will lose wages. Along these lines, the "*grow or die"* characteristic of capitalist markets is pertinent to the wage labourer, insofar as their survival is concerned (Ervine, 2018b, p. 33). Ervine states that within "a commodified system, one's bodily survival is contingent on access to money as the medium of exchange through which the necessities of life – food, clothing, shelter, and healthcare – are secured." (2018b, p. 33) Should the wage labourer lose their job, they lose the money they need to secure the necessities of life. Of course, within some societies, some of these necessities are deemed too important to leave to the imperatives of the market, but fear of lost wages remains a potent motivator for the wage labourer all the same. Failing to thrive in these societies can translate into shortened life expectancies as poorer people experience greater difficulty securing medical treatments (Ervine, 2018b, pp. 33-34), adequate nutrition and shelter.

By "transforming common or public resources into private property and assets to be sold for profit," a function of the market economy, labourers are separated from the resources they need to survive (Ervine, 2018b, p. 34). The separation of the worker from the commodity is a defining and continuous characteristic of capital. Capital must separate or enclose sources of reproduction in order to fulfill its growth imperative. The privatization and enclosure of resources needed by labourers to survive ensures that their lives become dominated by the need to produce goods to earn wages. Along these lines, capital also looks to enclose spaces not expressly dedicated to its reproduction. For example, the factory, a creation of capital, is a space that expressly enables the reproduction of capital, while other "life-worlds" such as "the school, the neighbourhood, the family, cyberspace – the realm of significant relations to objects and to other people" may not have been created expressly for the reproduction of capital (De Angelis, 2004, p. 67). Those spaces are created for social reproduction, which does not expressly enable capital to grow. That does not limit capital however. Capital will attempt to enclose spaces not expressly made it its image. Without trying to be glib, capital attempts to colonize spaces made outside of its image, intending to make these spaces work for capital's "priorities and drives" (De Angelis, 2004, p. 67). Enclosures, like the privatization of water resources in Cochabamba (De Angelis, 2004, p. 59), pollution from the intense shrimping operations in India (De Angelis, 2004, p. 79), or land grabs for the production of cash crops (De Angelis, 2004, pp. 78-79) all entail negative consequences for vulnerable populations who are separated from a commons (here, a source of social reproduction). Enclosure to De Angelis is a separation. By using the Marxist concept of alienated labour, De Angelis sees enclosures as contouring human activity towards facilitating capital accumulation. Producers are alienated from the objects of their production, the means of production and other producers (De Angelis, 2004, p. 65). De Angelis believes that capital would not stop trying to colonize commons, such as the school, the neighbourhood or the family until all socialized humanity ceases to exist (2004, p. 67).

The enclosures listed above in the global South have devastating consequences for those separated from resources they need to survive. De Angelis labelled these resources "commons" and throughout this thesis, the term "commons" will often be used to describe resources used by communities that do not adhere to the logic of capital. The CDM as an institution enables capital to enclose commons, be it as simple as trash heaps that could be repurposed for waste pickers in the global South or the "global eco-system as a global common." (De Angelis, 2004, p. 68) As we will see in this chapter, carbon markets have made it possible for economic actors to lay claim to atmospheric space. Humanity commodified the sky in the service of extricating humanity from disaster, as so too has it ripped away commons like water and land resources for some of the most vulnerable in the global South. Capital tries to enclose spaces set out for social reproduction. The advent of global carbon trading provided capital with another zone that could be commodified in the service of generating profit and that is why, as of 2017, ETSs applied 9.9 percent of global emissions (Ervine, Carbon, 2018b, p. 86). Rather than being seen as clear cause of the climate crisis, capital became the solution. The next section will explain how carbon markets came to be and how the Kyoto Protocol set out a framework whereby the global South could participate in carbon markets, allowing capital to further expand and at the same time separate more people from the resources they need to survive.

Making Use of Offsetting

As discussed in the introduction, emissions trading schemes make use of carbon offsets to provide an added layer of flexibility. Theoretically speaking, “One carbon offset credit represents the reduction of one metric tonne of *carbon dioxide* or its equivalent (tCO_2e) in other greenhouse gases” (Newell & Paterson, 2010, p. 191). Emissions trading schemes under the Kyoto Protocol make use of carbon offsetting to provide covered entities and countries with an added layer of flexibility for polluters who will surpass the cap. The CDM allows, “industrialised nations and their private corporations to invest in greenhouse gas emissions reductions projects in developing countries in order to achieve their own reduction commitments” (Newell & Paterson, 2010, pp. 191-192). By allowing covered entities on compliance carbon markets to employ carbon offsets to meet their obligations, policymakers invite a number of complex issues onto ETSs.

Debates around carbon offsetting follow predictable pathways as do the debates around carbon markets. Public choice theorists argue that carbon offsetting schemes through the CDM provide the benefit of allowing the global South to generate income while transitioning away from GHG production. CPE theorists on the other hand point to a number of problems with relegating the global South’s involvement with climate change to a market mechanism. Among them is that the project development community is too close to the UNFCCC and the CDM Executive Board (EB) resulting in regulatory capture, a long held concern for critics of emissions trading (Lang, 2009, p. 217; Lovell, 2015, p. 112). The EB fulfills a number of duties for the functioning of the CDM. The EB, situated in Bonn, Germany, is the UN body that registers CDM projects and the CERs generated by CDM projects (Newell & Paterson, 2010, pp. 84-85). Besides being the “ultimate point of contact” for all project participants (UNFCCC, 2019), the EB also works with a range of private, non-state actors to design methodology (Lovell, 2015, p. 112).

All CDM projects must create a project design document (PDD), a document which lays out all the stakeholders involved in the project (the project developers, the host community, the project operators, project consultants and any and all government bodies involved in the project’s authorization). A “project sponsor, investor or buyer” produces the PDD, and this party is labelled a project participant or PP (Newell & Paterson, 2010, p. 84). Often, consulting firms are hired to produce these documents due to the complex nature of offsetting projects (Newell & Paterson, 2010, p. 84). The PDD provides for the amount of emissions that would be produced in a business as usual (BAU) scenario (that is how emissions would appear without the project) and the quantity of emissions that any project expects to reduce during operations. These estimates are provided by a Designated Operational Entity (DOE), which audits the PDD to ensure the viability of the project. A PDD also provides a detailed project description including the methodology, the expected environmental and social benefits, and any comments provided by stakeholders (Newell & Paterson, 2010, p. 84). The host country’s Designated National Authority (DNA), an administrative body that all countries must create in order to approve CDM projects on the national level, then sends the approved PDD for authorization to the CDM Executive Board (CDM EB). Once the EB has accepted the project, the project developers will monitor the success of the project on an ongoing basis while a separate DOE is brought in to audit the project (Newell & Paterson, 2010, p. 85). If the second DOE's audit is successful, it will send a report to the EB, which will then allow the CDM to issue CERs (Newell & Paterson, 2010, p. 85).

The CDM attempts to "control and order the process of offset production… measurement processes and techniques [which] are critical to the overall goal of producing standardised (fungible) uniform credits that are dissociated from their origin." (Lovell & Liverman, 2010, pp. 262-263) This means that credits generated are to be disconnected from their source, meaning a CER is a CER is a CER. Coupled with the cozy relationship between the UNFCCC and the financial sector (Paterson & P-Laberge, 2018, p. 6), the design of these methodologies prioritises the trading aspect of the CDM. When the EB struck a "High Level Panel on Policy Dialogue" to determine the "current and future" trajectory of the CDM as a global offsetting mechanism (Newell, 2015, p. 214), the selection of this panel by the UNFCCC and the EB was politicised. The chosen nominees represented a cross-section of NGO and private sector actors who supported or benefited from the commercial aspect of the CDM (Newell, 2015, p. 222). The panelists then called for written submissions from a cloistered "epistemic community" who helped to design the CDM (Newell, 2015, p. 226). Axel Michaelowa, who sits on the CDM's Methodology Panel, was asked to provide a submission in support of the CDM. Michaelowa, a PCT academic who has conducted a wide range of scholarship on CDM projects, is also a project developer (Newell, 2015, p. 226). Michaelowa argues that CDM deficiencies concerning the provision of sustainable development can be rectified by simple rule changes (2014, p. 354). In choosing not to hear from more critical voices, the EB helped to support a system which seeks large quantities of data from CDM projects so the system can at least appear to be conducting due diligence (Newell, 2014, p. 332). That said, Newell points to Paterson's argument (2010) where he argues that whether the CPE perspective is included in EB's assessment of the CDM going forward or not, the CDM still needs to confront these shortcomings should they want to demonstrate to CDM participants that the data collection is more than just a Sisyphean exercise (Newell, 2015, p. 219).

Because carbon offsetting follows a "belief in the efficiency of markets to solve policy problems" (Lovell & Liverman, 2010, p. 269) the hope is that by opening the global South to market based programs like the CDM, they can benefit from the economic activity and participate in the global fight against climate change. Offsetting emissions reduces the moral issue of polluting into an economic transaction. Proponents reason that those who wish to pollute can do so by paying other parties to reduce their emissions, thereby making it as if the pollution never happened. A lesser economically developed region can benefit from the added economic activity that comes from offsetting projects (Newell & Bumpus, 2012, p. 55). In the case of the CDM, proponents tout projects as a triple-win. First, developing countries benefit from the economic activity that would not have taken place were it not for the offsetting investment. Second, the polluter purchases the right to pollute, and third their economic activity continues unabated. The income disparities between the global North and the global South are one of the main marketing strategies for the CDM. The CDM and international carbon offsetting operates within the principle of Common But Differentiated Responsibilities (CBDR), a key tenant of the UNFCCC's approach to the economic disparities between the North and the South. CBDR embodies the Kyoto Protocol negotiations. The global South, aware that they were not primarily responsible for the climate crisis, wanted the global North to take the lead in reducing emissions given their earlier levels of industrialization. CBDR also allows for a critical perspective of global climate governance that exposes the hierarchical nature of the global economy (Chaturvedi & Doyle, 2015, p. 195). Northern rhetoric around “sharing the finite atmospheric global commons” does not account for the fact that the global North pollutes the atmosphere at ten times greater levels than the global South (Chaturvedi & Doyle, 2015, p. 195). There has to be an account for the fact that the global North has benefited from decades of depositing GHGs into the atmosphere while the global South has only recently begun to account for large amounts of GHGs resulting from industrialization. Realistically, there is no longer an abundance of space in the atmosphere as levels of GHGs from human activities have reached critical levels (Chaturvedi & Doyle, 2015, p. 68). As discussed in the introduction, the global South wanted some form of financing to ensure their transition away from fossil fuels and the global North wanted to receive some return on their investment. The return here is the offset. The negotiators at the Kyoto Protocol negotiations grasped on to offsetting, much like carbon markets, as ready-to-use, apolitical technical device (Newell, 2015, p. 220). The tradeable property rights generated by offsetting projects (Brown, Cloke, Gent, Johnson, & Hill, 2014, p. 246), suggested “an unproblematic elision between deploying the environment to engender new forms of growth, and techno-financial innovation to cleanse problems within the current economy” (Brown, Cloke, Gent, Johnson, & Hill, 2014, p. 249). The atmosphere becomes an “ecosystem service provider,” (Brown, Cloke, Gent, Johnson, & Hill, 2014, p. 249) where, despite its use as a dumping ground for excess emissions since the industrial revolution, its space can now be bought and sold in service of allowing those with the ability to pay to keep on polluting. Regardless of nation-state borders, the wealthy were not going to be able to avoid the shocks and stresses placed on the climate by the production of GHGs (Chaturvedi & Doyle, 2015, p. 82). Therefore, the atmosphere is repositioned as a service that can be used to avoid a climate crisis.

Offsetting a problematic behaviour, like polluting, is not new. While emissions offsetting finds a welcoming home within neoliberal economics, the practice goes back centuries. There are similarities between the practice of emissions offsetting and indulgence payments condoned by the medieval Catholic Church. The Catholic Church allowed sinners to purchase penitence from the professionally pious (Spash, 2010, p. 188). The wealthy could “pay professional pilgrims, prayers and penitents” to avoid needing to pray themselves (Spash, 2010, p. 188). A rich person was in effect purchasing salvation without needing to adhere to the strict rules set out by the Catholic Church (Spash, 2010, p. 188). Rich sinners took advantage of the ability to pay off their sins, engaging in evermore-sinful activity (Spash, 2010, p. 188). Offsetting then and now was like paying someone to go on a diet and “claiming the weight loss as your own” (Checker, 2009, pp. 43-44). The correlation between these practices and emission offsetting is rather clear. When accounting for offsetting on the EU ETS, estimates suggest, “European emissions were actually about 1% higher in 2008 than they were in 1990.” (Checker, 2009, p. 44) In 1990, the EU ETS was not in place, meaning that in a system where offsetting was available to polluters in 2008, emissions were still higher than they were before the EU ETS emissions regulation came into effect in 2005. Furthermore, by 2008, the price for CERs had not crashed to where they stoked a crisis on the EU ETS 2009 (Ellerman, Marcantonini, & Zaklan, 2016, pp. 101-102). Following the 2008-2009 financial crisis, when offsets were much cheaper on the EU ETS, it enabled the continued use of high emissions technology (Machaqueiro, 2017, p. 84). When you create a system that allows for a cheaper alternative to “lengthy penances,” you will almost inevitably see an uptake of the cheaper alternative (Spash, 2010, p. 188). The data demonstrates when you flood a system with cheaper offsets, emissions increase. The verified emissions generated under the EU ETS in 2012 reached 1.87 billion tonnes of tCO_2e (Sandbag, 2019). The EU ETS allowed almost half a billion offset units onto its system the same year, which is almost a two-fold increase from the number in 2011 (Sandbag, 2019). In 2013, verified emissions on the EU ETS increased by over 2 percent (Sandbag, 2019). Despite the criticism that offsets generated are helping emissions to increase in jurisdictions with carbon markets, offsetting proponents point to evidence that CDM projects have, in some contexts, scaled up economies, with “the specific political, economic, social, and ecological contexts in which projects are implemented” being variable (Newell & Bumpus, 2012, p. 55). Offsetting also allows economic activity to continue unabated in the global North while allowing states to meet their reduction commitments under the Kyoto Protocol, according to proponents of the system. Nevertheless, the CDM’s flood of credits onto the EU ETS helped to lower the price of carbon, making it much cheaper for covered firms to pollute (2012, p. 1180).

The crash of carbon prices on the EU ETS is proof that if they are going to help economies decarbonize, emissions markets need constant supervision. Free marketers suggest that markets should be left to those using them to buy and sell goods, but the reality is that markets require a lot of work to make trading feasible. This is especially true for offsetting. Commensurability is crucial to markets because it provides for an understanding of the relationship between price and quantity. By asserting that a “bushel” or some other form of measurement comprised a specific quantity of mass or volume, it becomes easier to track the amount of commodities being purchased across an entire market. The implementation of these measurements to serve markets requires significant work. In order to weave a sense of trust through the grain market, for instance, the 19th century Chicago grain futures exchange needed to employ a phalanx of grain inspectors to ensure that the grain shipped adhered to implemented norms (Lohmann, 2009b, p. 507). Carbon markets, like any other market, require uniformity in measurement to ensure a tradable commodity (Machaqueiro, 2017, p. 83). This is how the tonne of carbon dioxide equivalent (tCO_2e) became the unit that allowed carbon markets to function (Machaqueiro, 2017, p. 83). Establishing the tCO_2e as an international measurement for tradable atmospheric space required a number of important underlying measurements, many of which require the calculation of GHG potency over large periods. There is also the political aspect of calculating emissions and their global warming potential (GWP).

Crucial to the production of offsets, the UNFCCC lists the GWP of CO_2 as its baseline. That means over a 100-year period, a tonne of CO_2 has a GWP of “1.0” (UNFCCC, 2014). Compare methane (CH_4) with CO_2 and CH_4’s GWP over 100 years is 21 times that of CO_2. Certain industrial gases can be many times more potent than even CH_4. HFC-23, the gas produced in industrial refrigeration production mentioned in the introduction chapter, has a GWP 11,700 times that of a tonne of CO_2 (Newell & Paterson, 2010, p. 130). The UNFCCC’s calculations for CH_4’s GWP differ from those of the U.S. Environmental Protection Agency (EPA) that states that CH_4 is 25 times as potent a GHG over a 100-year period (U.S. Environmental Protection Agency, 2017). Both the UNFCCC and the EPA seem to agree on nitrous oxide’s (N_2O) GWP calculation, estimating its potency at roughly 300 times that of CO_2 over 100 years (UNFCCC, 2014; U.S. Environmental Protection Agency, 2017). Calculating GWP is complicated by the ability of flora to absorb and store CO_2, which forces officials to speculate on how long the carbon will remain within plant matter (Ervine, 2013, p. 658).

Proponents of carbon offsetting suggest that reductions of carbon dioxide undertaken globally have a uniform effect on the environment. The thinking goes that a CO_2 molecule emitted has an equal effect on the atmosphere, whether it is emitted in "Samarkand" or "Sandusky (Lohmann, 2009a, p. 27). However, the effort that goes into calculating reductions in carbon dioxide at the site of offset projects in the global South can be much more complicated (Lohmann, 2009a, p. 27). As stated earlier, carbon's social embeddedness across a multitude of activities means calculating tCO_2e reductions requires knowledge of how the GHGs are being reduced at the project site. Lovell and Liverman point to Bumpus' argument that tradable carbon is "slippery" given the technologies involved in making demonstrable reductions in GHGs (Lovell & Liverman, 2010, p. 263). The creation of tCO_2e, the unit that under carbon trading regimes individuates the tradeable credit in atmospheric space, divorcing it from the activity that created the space in the first place becomes *the* preoccupation for the parties involved in making offsets usable on international compliance markets (Lovell & Liverman, 2010, p. 263). Bumpus argues that tensions between material reductions in CO_2 and the market requirements that govern emissions allowing for commodification depend on the technology doing the offsetting (2011, p. 618). The carbon reducing technology matters when attempting to commodify reductions in tCO_2e. Here, Bumpus argues that some offsetting technologies are more cooperative than others, where the commodification process is achieved with varying degrees of difficulty (2011, p. 620). For example, offsetting projects do not necessarily need to rely on large-scale industrial installations to generate tradable offsets. As stated in the introduction, cookstove CDM projects replace stoves that require a relatively high input of fuel or biomass with ones which require less fuel. This helps to reduce the production of GHGs, requires less wood, which saves money for participating households, and helps to reduce cases of localized deforestation. Of course, commodifying the production of tCO_2e in households is complicated. Project managers must ensure that all recipients of cookstoves use them on a frequent basis, which can be expensive and time-consuming (Wang & Corson, 2015, p. 2073). These projects also need to understand the dynamics of the local economy, politics around the preparation of food and language barriers. A cookstove project in Western Kenya only provided an agreement to participate in the offsetting project in English. This meant that the NGO doing outreach for the project had to translate the concept of transferring carbon credits to international buyers in Dholuo, the local language (Wang & Corson, 2015, p. 2075). One field staff member for the project was not sure if emitting GHGs or offsetting GHGs was the aim of the project (Wang & Corson, 2015, p. 2075). More challenging to the project were the local dynamics around fuel consumption. Measuring the "messy" production and consumption of wood for the cookstoves clashed with the project coordinators' use of "statistical averages generated from idealized ways of measuring firewood." (Wang & Corson, 2015, p. 2075) To be clear, this meant that those involved in the project were unsure if the produced offsets really represented avoided emissions, assailing the project developers' claims that the project was legitimate.

Finally, CDM project developers must demonstrate that their projects are additional. Considering additionality means that project developers must demonstrate that they know what the projects are counting for and against when compared to a business-as-usual (BAU) scenario (Ervine, 2018b, p. 96). This means that project developers must determine how much emissions would be produced in a scenario where nothing changed.

This scenario, conjured up by project developers relies on estimating what emissions would be created if the CDM project did not begin. For example, if investors wanted to build a hydroelectric dam somewhere in the global South, but lacked the finance to make the project happen, they could seek CDM financing, which could allow the dam to become financially viable. Project developers would then compensate the financiers from the CERs the dam generates. The project developers would need to determine how many emissions could be avoided with the construction of the dam. Around 20 percent of all CDM projects are hydroelectric based (Koo, 2017, p. 869). Hydroelectric power, as an emissions mitigation tool, was expected to overtake industrial gas projects by 2020 (Koo, 2017, p. 869). Regardless of their popularity, hydroelectric projects have been particularly vexing for CDM policymakers when attempting to determine additionality. A 2016 study by the Öko-Institut found that most CDM energy projects were unlikely to be additional (Cames, et al., 2016, p. 10). The authors of the study reviewed over two thousand hydropower projects and did not determine that any of those projects were additional (2016, p. 13). The authors suggested this was because “the revenue from the CDM for these project types is small compared to the investment costs and other cost or revenue streams, even if the CER prices would be much higher,” than they were at the time of writing (2016, p. 13). This means that CDM financing never mattered on whether these projects would go ahead or not. This was not just evident in 2016. In 2010, a leaked U.S. diplomatic cable suggested that most CDM projects could not be considered additional if scrutinized properly (Newell, 2015, p. 213). Efforts to prevent abuse of additionality parameters have kept PCT academics like Axel Michaelowa busy. Michaelowa acknowledges that there have been issues with additionality and the CDM, but that the rules from the CDM should be maintained for the Paris Agreement mechanisms so as not to alienate current CDM participants (Michaelowa, 2017, p. 66). In contrast, CPE theorists have critiqued the additional nature of the CDM for years. Carbon financing is viewed by project developers from a range of CDM projects types as just "an additional funding stream" (Baker, Newell, & Phillips, 2014, p. 793) which is how CDM financing was regarded by CDM energy project developers in all Öko-Institut studied cases. CDM financing helped increase profits for project developers, but its presence in these projects *did not matter*, which means the offsets credits these projects generated do not represent emissions reductions because the activity at the project level happened anyway.

Conclusion: The Human Cost of Offsetting

By assigning property rights to atmospheric space, the global community creates a system whereby the global South is hosting carbon commodification projects through the CDM. Communities in the global South undertaking a CDM project will need to engage in an activity they were not doing before to generate CERs. These activities can often entail a process of enclosure that will separate people from the commons. David Harvey's concept of "accumulation by dispossession" where Harvey contends that governments, in addressing crises of over accumulation introduce "new spheres of accumulation by privatizing public goods and services and facilitating the enclosure of common resources" is helpful in understanding state involvement in the CDM (Samson, 2015, p. 815). Harvey argues that capital constantly needs something outside of itself (Gutiérrez, 2011, p. 641), and the state assists in this process. Every CDM project receives the approval of the host state's DNA. This means that all CDM projects, whatever their effects may be, have the blessing of the host site's state. One such privatization of a public good for a CDM project occurred in Pune, India. Years before the CDM project took place in this city, a waste pickers' trade union was established in 1993 to agitate for better working conditions for the waste pickers (Kabeer, Milward, & Sudarshan, 2013, p. 251). The union named Kagad Kach Patra Kashtakari Panchayat (KKPKP) boasts a membership of over 6000 and has helped to reframe waste picking as a nuisance practice conducted by itinerate workers, to a crucial environmental service for the municipality (Kabeer, Milward, & Sudarshan, 2013, p. 251). The authors point to "environmental discourses" that the KKPKP utilized to articulate their members' contribution as "environmental managers, recyclers, and re-users of waste products" (Kabeer, Milward, & Sudarshan, 2013, p. 254). Of course, so-called environmental discourses were at work against KKPKP members as well. A CDM waste incineration project created in Pune competed for the same waste that KKPKP members sell for their livelihoods (Kabeer, Milward, & Sudarshan, 2013, p. 254). The incineration project was set up with CDM financing and since then, the trade union has been lobbying against the financing of incinerators through the CDM (Kabeer, Milward, & Sudarshan, 2013, p. 254).

The waste workers union agitated against the privatization of the waste, the commons for the workers. In the case of the KKPKP workers, the incinerator project attempted to enclose recyclable waste, a resource they required to support their livelihoods. Moreover, many women who work as waste pickers in the global South contend with overlapping inequalities concerning "class, race, caste, occupation, and legal status" which magnified the potential loss of the waste commons (Kabeer, Milward, & Sudarshan, 2013, p. 250). The CDM's use as a method of separating marginalized people from a resource in the interest of "sustainability" is one of a number of glaringly negative consequences, indeed one of the most grotesque, of the offsetting mechanism.

The Kyoto Protocol enshrined global carbon commodification in 1997. While it appears that carbon markets are here to stay, the future of offsetting is uncertain. For a time, the CDM was a major source of finance to the global South (Ervine, 2014, p. 724), but that funding has collapsed. Proponents argue this process of adding value to air is supposed to make it harder for *everyone* to pollute, but emissions are not falling drastically enough or quickly enough, despite the growing number of compliance emissions markets. CDM investments performed excellently for a time, as we will see in the following chapters, but even if the cost of CERs performed well enough to ensure that these projects would pay dividends to the host communities, we would still see the enclosure of resources through CDM projects. Diminishing water quality, diminishing localized air quality or a loss of access to commodities often plague CDM projects, prompting critics to assail the flexibility mechanism as detrimental to human rights (Martinez & Bowen, 2013; Ervine, 2015; Bond, 2014). Lohmann points out that Kevin Anderson, professor of energy and climate change in the School of Mechanical, Aeronautical and Civil Engineering at the University of Manchester, argues correctly, “offsets are worse than doing nothing” (Lohmann, 2012, p. 1180). The way CERs were allowed to flood the EU ETS, critically bringing the price of carbon down to the point where the market effectively stopped functioning, suggests that Anderson has a point. Of course, the global South needs finance for climate adaptation and mitigation, with the CDM only assisting with the latter. The following chapter will attempt to demonstrate how carbon enclosure works through the CDM by focusing on some of the major scandals that emerged since the CDM began operations in 2005, and highlighting the human cost of these offsetting projects.

Chapter Three: Case Studies

Governing an offsetting mechanism that needs to connect the global North and the global South has been a complicated undertaking. The coordination needed between countries, the private sector, and the UNFCCC has required all parties to consistently troubleshoot issues with the CDM as they arose. The last two chapters tried to demonstrate that any troubleshooting that would happen would have more to do with ensuring that the CDM would survive as a financial product that could be bought and sold, and less to do with ensuring that the mechanism would produce an environmentally trustworthy offset that would not also create negative side-effects. This chapter will show that the CDM’s characteristics as a tool for capital accumulation superseded the mechanism’s vaunted goals as a form of development for the global South. These characteristics also helped the CDM to produce offsets of questionable environmental fidelity while often generating lopsided development and problematic consequences for communities hosting the projects.

The additionality of projects, the fidelity of CERs being issued by projects and the impacts of projects on local communities meant that CDM proponents were constantly trying to extinguish metaphorical fires lit by this offsetting mechanism. Uneven institutional and industrial capacity across the global South became a huge challenge for proponents of the CDM, as China and India were able to absorb most of the CDM projects and created most of the CERs. Complicating matters was the obscure measuring system dubbed global warming potential (GWP). Because the CDM allowed projects to qualify for carbon credits if they demonstrated reductions in or *avoidance* of more potent greenhouse gases (GHGs) besides carbon dioxide (CO_2), a litany of projects that reduced potent industrial GHGs made use of the GWP function of the CDM to the great benefit of

CDM financiers. Marrying a market-based offsetting mechanism to the intricacies of GWP opened the CDM up to fraud and helped project developers generate millions, while doing little to actually reduce emissions. This activity could only take place in countries where they already had the industrial capacity to make these CDM projects work, precluding least developed countries (LDCs) from participating in these lucrative projects. Because the CDM exists as a way for project developers to make a return on investment, critics worried that the “low-hanging fruit” would be harvested first (Olsen, 2007, p. 65). This is indeed what happened.

The particularities of the CDM’s global distribution has been a key concern for CDM supporters and critics alike. Supporters of the CDM marketed the mechanism to help scale up developing economies all over the global South, but the mechanism failed to achieve significant penetration in LDCs. CDM project distribution bulged toward the benefit of a select number of countries. There are a number of reasons for this. For starters, industrialized countries in the global South like China and India (and to a lesser extent Brazil and Mexico) were able to offer low-cost CDM investments immediately, while LDCs lacked the institutional and industrial capacity to offer similar investment opportunities. This is one of the clearer examples of how the CDM creates winners and losers between Southern states. The power held by project developers to pick and choose where they set up a CDM project created the imbalance in project distribution, a clear indictment of the offset mechanism as a framework that was supposed to replace development assistance from other sources.

The issues around GWP and the distribution of projects are also clear examples of where using a market-based mechanism opened the door to dishonest practices, and lopsided distribution of benefits. Capital, empowered by the CDM to reproduce itself under the guise of sustainability, made use of any loophole possible to create further pathways for growth. Simply put, project developers and financiers used the CDM to generate money regardless of the environmental impacts. The CDM should prevent situations where grazing lands are disturbed, water quality is tarnished or air quality worsens around project sites, but the CDM failed in this regard. The technologies employed to avoid or reduce emissions are primarily subjected to a "cost-benefit analysis" while questions concerning the morality of the technologies being employed received less attention (Lovell & Liverman, 2010, p. 269). Compounding these issues are the fact that "sustainable development" is not monetized or codified within the CDM in any meaningful way (Olsen, 2007). The definition of sustainable development is therefore left to the states hosting the projects, meaning that these standards can vary (Newell & Bumpus, 2012, p. 54).

Repeatedly, the CDM has been pockmarked by examples of human rights abuses in the global South. CDM projects often enclose upon crucial resources people made use of before a CDM project came into effect. Importantly, the power dynamic created by the CDM pits powerful capitalized interests against relatively weaker populations in the global South. Carbon enclosures, where local commons, like acceptable air quality and drinkable water are supplanted in search of profits, have become defining characteristics for many CDM projects. The CDM centralizes power under the project developers, who are able to use the CDM's approval process to appear as if they collaborate with vulnerable stakeholders. The CDM's disruptive nature empowers wealthy project developers to victimize scores of people across the global South, in search of profits, often sullying commons in the process. The CDM's track record is one of uneven development, creating dual problems for communities that do host the projects and enclosure, both on the atmospheric and project levels. This can all tied back to the CDM's formation as a tool for capital accumulation.

GWP and HFC-23

One of the most glaring examples of the CDM being used as a tool for capital accumulation is apparent in HFC-23 projects. For starters, the problematic formation of GWP as a way of denoting the amount of CERs a project might produce demonstrates how the CDM opened the door to massive profiteering. The UN's scientific panel on climate change, the Intergovernmental Panel on Climate Change (IPCC), admits that the calculations for GWP are "gross oversimplifications" (Lohmann, 2009b, p. 514) which nevertheless rely on complicated algebraic formulas to calculate potency (MacKenzie, 2009, p. 445). After developing a GWP of 11,700 times CO_2 for HFC-23 in 1995-1996, the IPCC revised that number a decade later to a GWP 14,800 times that of CO_2 (Lohmann, 2009b, p. 514). How is there such a range of disagreements on GWP calculations? Lovell asserts that by examining the makeup of actors involved in CDM project development we can get a sense of why disparities in GWP are not considered more problematic. Lovell suggests that because the CDM is run by "largely private sector actors" on the bottom level, the Clean Development Mechanism Executive Board (CDM EB) is reluctant to do much about the disparities emanating from GWP (2015, p. 112). Lovell notes that because the private sector has had such an outsized role in designing CDM methodologies, that bloc succeeded in creating hundreds of these methodologies for different types of projects. Furthermore, these methodologies usually failed to "make the necessary political decisions to resolve contentious issues" while "producing outcomes riddled with inconsistencies." (2015, p. 112) Sustaining the offsetting market was more important than the production of verifiable reductions in GHGs. The CDM EB knows that if they continuously revise GWP to reflect what scientists argue is a realistic number that it could damage the perceived integrity of offsetting projects. The actual ability of these markets to diminish the amount of tCO_2e being produced by anthropogenic activities is of varied importance, the more crucial issue for financiers is market survival (Lohmann, 2012, p. 1179).

As mentioned in the introduction, CDM eligibility rules required that companies were producing HFC-23 during the 2000-2004 period, before CDM projects could begin producing CERs (The Economist, 2010). This prevented companies from simply producing the gas and then destroying it to generate CERs once the CDM came into effect. However, it became apparent that the CDM incentivized the destruction of the gas for those producers who were producing it in the 2000-2004 period. CDM market monitors discovered that producers of the refrigerant gas had decreased their production before the CDM came into effect, only to increase it once they became eligible to qualify for offsetting (The Economist, 2010). Around 20 projects therefore qualified for millions of CERs in the process (Garside, 2016), many of which were over-credited thanks to the intentional increase in HFC-23 production. Following the discovery of the gaming by offset market monitors, eight HFC projects were placed under review (The Economist, 2010). As of 2013, eight years after the CDM had officially commenced and when the EU ETS stopped accepting CERs from refrigerant gas destruction projects, roughly 75 percent of all CERs had come from CDM projects that destroy powerful GHGs like HFC-23 (Käkönen, et al., 2013, p. 45) and N_2O. Chinese HFC-23 projects continued to operate following their barring from the EU ETS, but that was thanks to credits from those projects being accepted on China’s emissions market, as well as state subsidies disbursed to those projects (Carbon Pulse, 2018). Those playing close attention to Kyoto Protocol flexibility mechanisms noted that the high GWP of HFC-23 had enabled billions of dollars in market activity. Donald MacKenzie pointed out that by 2012, HFC-23 projects would have likely generated $3.5 billion in market activity (2009, p. 447). HFC-23 projects are cheap to operate as well. Around 2008, when CERs from these projects were still accepted on the EU ETS and when those credits traded for around 24 euros on that market, CDM projects destroyed refrigerant gases for less than a euro per tCO_2e (Garside, 2016), which meant that operating these projects could be extremely lucrative. Because of this activity, by 2016 roughly a third of all CERs produced globally have been awarded to 19 HFC-23 projects (Garside, 2016). CDM market watchers suggest that while it is impossible to know how many CERs are the result of fraudulent activity, estimates ranged from “one-third to one-half of all CERs” could be “manufactured pollution.” (Gronewold, 2010) However, a 2016 study by US-based think-tank Resources for the Future found that “under-credited [HFC-23] emissions reductions nearly equal the supply of over-credited offsets,” (Garside, 2016) somewhat negating the documented fraudulent activity. Nevertheless, well after the EU ETS stopped accepting emissions credits generated from HFC-23 projects, emissions of HFC-23 reached their highest recorded levels in 2018 (Stanley, et al., 2020), meaning these projects may have stoked industrial activity that could have devastating consequences for the Earth’s climate.

It might also be useful to look at the impacts of HFC-23 projects on the ground level. In India, five manufacturers produce HFC-23 (Jalan, 2016) as a by-product of producing refrigeration products (Dabhi, 2009, p. 139). Developers set up one such HFC-23 destruction project in Ranjitnagar, a village in Panchmahal District, within the state of Gujarat (Dabhi, 2009, p. 138). The refrigerant company, Gujarat Fluorochemicals Limited (GFL), received technology from England to combust the HFC-23 (Dabhi, 2009,

p. 139). In this case, the company received financing to purchase the technology from a British party and would pay the financiers back through the proceeds generated from CERs produced at the project site. The PDD suggested that the project would be sustainable through the provision of "selected community development activities such as education; vocational training; employment; agriculture; sanitation, hygiene & environment; water management; medical and animal health," which would be paid for through the sale of CERs (Dabhi, 2009, p. 140). Of course, the aspirations listed within the PDD were much different from what was provided to those living in close proximity to the plant. Prevailing winds from the HFC-23 incineration operation passed over a lower income community, degrading air quality (Dabhi, 2009, pp. 140-141). This is a textbook case of enclosure through the CDM. The air is fouled in service of HFC-23 incineration, a practice that was not happening at the same rate before the CDM project began. Labour standards for these projects are not much better. At a wage of less than $2 USD a day, GFL compensated workers poorly (Dabhi, 2009, p. 141). Meanwhile, GFL imported workers from neighbouring Indian states, increasing potential for local displacement within established communities (Dabhi, 2009, p. 142). In response to community pushback against the plant, GFL engaged supportive political forces to break up resistance to the CDM project, either by employing police to intimidate resistance or by using money to bribe locals, thereby making certain groups in the community more pliant (Dabhi, 2009, p. 144). Nevertheless, fears around the volatile nature of the chemicals handled at the plant ensured that some people in the host communities would not take money from GFL and continued to push back against the plant's operation in their midst (Dabhi, 2009, p. 144).

If we allow that countries and firms buying CERs have an interest in reducing emissions, it is harder to apply that claim to project developers who are motivated by the potential profits of selling carbon credits (Martinez & Bowen, 2013, p. 812). The CDM did not incentivise the lowering of emissions in the case of HFC-23. In fact, it produced the opposite effect where companies were attempting to increase the amounts of the refrigerant gas ahead of CDM implementation. While it is not apparent that the CDM is responsible for the ever-increasing amounts of HFC-23 in the atmosphere, compensating projects that reduce emissions of that gas have not coincided with a reduction of the gas in the atmosphere. This is precisely what many CPE theorists were worried about when the CDM allowed HFC-23 projects to proceed under its framework. The CDM took hold because proponents saw it as way to create a durable coalition between southern capital and northern financiers in the service of facilitating clean development in the global South and facilitating a transition away from fossil fuels in the global North. The proponents that fought for the inclusion of HFC-23 projects in the CDM should have anticipated the fraud emanating from them. The inclusion of these projects provided capital with an opening to reproduce itself, much to the detriment of the global atmospheric commons.

Distribution

The fact that the vast majority of HFC-23 projects were located in China and India are also a symptom of the market-based characters of the CDM. COP 7 in Marrakech in 2001 produced accords that were intended to support the equitable distribution of CDM projects across "regional and sub regional levels" (Burian & Arens, 2014, p. 168). However, at the outset of the CDM, one of the primary concerns held among market watchers was that investment would target the projects that offer the largest return for the smallest investment, like HFC-23 projects. Because the CDM came about in a time when ODA was diminishing (Ervine, 2013, p. 657), CDM proponents suggested that the offsetting mechanism could fill that vacuum. However, this would mean that project distribution would need to occur evenly, at the very least to support claims by proponents that the CDM could be a legitimate substitute to aid funding. Already developed industrial capacity in countries like China and India allowed those countries to implement low-cost CDM gas destruction projects that generated many CERs for relatively small investments. The result is that China hosted around 45 percent of CDM projects, globally (UNEP, 2018). China is so well known for hosting CDM projects, critics of the mechanism began to label it the "China Development Mechanism" colloquially (Käkönen, et al., 2013, p. 43). India also maintains a huge share of CDM projects compared to other Southern countries, hosting 24 percent of all CDM projects (UNEP, 2018). The Asia & Pacific region hosts just over 80 percent of the world's CDM projects, while Latin America hosts just over 13 percent of CDM projects (UNEP, 2018). Brazil and Mexico host around 4 and 2 percent of the world's CDM projects (UNEP, 2018). After the Asia & Pacific region and Latin America, the African continent hosts a paltry 2.9 percent of projects (UNEP, 2018).

The lopsided distribution of projects became such a point of contention that European Commission announced that the European Union Emissions Trading Scheme (EU ETS) would only be accepting CERs from LDCs after 2012. Following this, African nations sharply increased project registration levels, however most of those projects began in North African countries and South Africa (Kreibich, Hermwille, Warnecke, & Arens, 2017, p. 178). Furthermore, while registered projects are just one measurement for success, Africa has not been a significant progenitor of CERs and has registered far less than what was expected (Kreibich, Hermwille, Warnecke, & Arens, 2017, p. 182). The African continent had hoped to see a large increase in CDM projects following the announcement that the EU ETS would no longer accept CERs from non-LDCs. However, as mentioned earlier, a downturn in the global economy following the 2008-2009 financial crisis and the saturation of the EU ETS by CERs from refrigerant gas destruction projects weakened demand on the (then) world's largest carbon market (Kreibich, Hermwille, Warnecke, & Arens, 2017, p. 180). But the UNFCCC knew as early as 2006 that all of sub-Saharan Africa, despite having potential for CDM projects, was struggling to attract investment (Kreibich, Hermwille, Warnecke, & Arens, 2017, p. 178). Countries that have a built up CDM project verification capacity are able to move projects through the bureaucratic project verification process for less money compared to countries that have to rely on outside parties. For example, CDM projects need to be both verified and monitored by a Designated Operational Entity (DOE) (Ervine, 2013, p. 665). The prices offered by DOEs can vary depending on where the DOE is offering its services. Project validation can be relatively expensive in Africa compared to Latin America or the Asia & Pacific region (Kreibich, Hermwille, Warnecke, & Arens, 2017, p. 179). The downturn in CER prices has also coincided with a downturn in the ability of project verification firms to maintain a presence in Africa, as less new projects means less available work (Kreibich, Hermwille, Warnecke, & Arens, 2017, p. 184). Projects in sub-Saharan Africa that received authorization to operate before 2013 have begun to wind down CDM operations (Kreibich, Hermwille, Warnecke, & Arens, 2017, p. 188). Counterintuitively, the deleterious nature of the CDM at the project level meant that some LDCs avoided some of the worst localized impacts of offsetting projects by being overlooked by project developers. While this is not entirely negative outcome, the nature of the CDM as an offsetting mechanism driven by investment means that should it, or frameworks like it, be used as a way to replace ODA, then the countries that need financing to adapt to the climate crisis will be neglected.

Smaller countries can attract investment in order to host CDM projects, but treating the CDM as a method of obtaining foreign direct investment has its drawbacks. While the CDM is intended to spur sustainable development outcomes, sustainable development as a term is not well-defined (Olsen, 2007, p. 62), and not monetized within the CDM framework (Olsen, 2007, p. 64). This means two things. One, that beyond the obvious reduction of emissions, there are no defined parameters within the CDM to deliver on these types of benefits, whatever they may be, and two, project developers are not financially incentivized to deliver any sustainable developments other than emissions reduction activity. In contrast to ODA, where there may not be an expressed need for projects to provide a material return on investment, CDM projects must provide for a financial return. If smaller countries are going to attract CDM investment, they need to market potential projects as a way to generate revenue for foreign investors, rather than by marketing projects as a method of clean development. However, the CDM has recorded high levels of activity in countries that already receive large sums of foreign direct investment. China, India and Brazil received the bulk of CDM financing and enjoyed high levels of foreign direct investment (Watts, Albornoz, & Watson, 2015, p. 1178).

True to form, the distributive characteristics of the CDM ensured that countries that offered the cheapest investments in emissions reductions or emissions avoidance were the ones who garnered the most investment in CDM projects. Market-based mechanisms like the CDM will not direct finance towards those in the global South who need it most because the material conditions of the poorest countries in the global South do not facilitate these investments. This is another reason why the CDM's construction, first and foremost, as a tool for capital accumulation cannot hope to assist with the adaptation efforts needed across the global South. Even when markets that accepted CERs in the global North made major changes to which countries they accept CERs from, the prices for CERs were too low to make a difference and stoke project activity more evenly. On the other hand, when there are financing opportunities for CDM project developers in the global South, the destabilizing nature of the CDM often creates unwanted side effects, usually affecting the most vulnerable. The next section will focus on a number of case studies where the CDM degraded the environment or deprived vulnerable populations of resources they relied upon. Capital always needs something outside of itself to thrive. As we will see in the next section, the global atmospheric commons was not the only victim of carbon enclosure.

The CDM, the Dual Problem and Enclosures

In 2004, some participants at COP10 in Buenos Aires noted that all the discussions concerning the CDM revolved around money (Edwards & Roberts, 2015, p. 47). Participants seemed to be mainly concerned with how much profit the CDM could generate and how quickly it could generate it. The groundwork was laid during the Kyoto Protocol negotiations, which ensured that the CDM would be a market mechanism directing finance towards the global South without clearly defining what "clean development," meant. By leaving climate change mitigation to the imperatives of capital, the CDM helped to critically weaken the price of carbon on the EU ETS. Generation of

CERs from refrigerant gas destruction projects slanted whatever economic activity the CDM could muster, to two major economies in the global South while eschewing other LDCs with critically low levels of development (Kreibich, Hermwille, Warnecke, & Arens, 2017, p. 178). In areas where the CDM has created projects, the so-called “clean” benefits of the CDM are generally not forthcoming. This is especially true when these projects enclose commons.

The CDM presented businesses under compliance markets with a cost-effective means of meeting their emissions caps, but it also presented businesses with an opportunity to market the use of carbon offsets in their marketing campaigns. The Eurostar passenger rail transport company committed to offset all trips aboard their trains in 2007 (Böhm, 2009, p. 119). Böhm argues that thanks to the impersonal nature of capitalist markets (2009, p. 120) companies indirectly support CDM projects. In this case, Böhm draws a line between Eurostar’s purchase of CERs to a eucalyptus and pulping operation in the rural Uruguayan settlement of Fray Bentos that qualified for CDM finance. The operation, run by a firm called Botnia, engaged in pulping the lumber harvested from the local eucalyptus plantation (Böhm, 2009, p. 120). The pulping process leaves behind a significant amount of biomass, which the operation feeds into a boiler to generate electricity (Böhm, 2009, p. 120). Because project developers label the biomass a renewable resource, a resource that the project developers suggest generates fewer emissions than traditional fossil fuels, the company receives financing to ensure that the process can generate electricity for the power grid (Böhm, 2009, p. 120). In this case, Botnia stands to profit from its pulping operation, from generating electricity and from the proceeds generated by the sale of CERs (Böhm, 2009, p. 121).

While it is true that the company profits from this process, Böhm asks that we consider the wellbeing of the community that hosts the pulping operation. For starters, the eucalyptus plantation needed to provide lumber to the pulp mill creates a number of problems for the area. Eucalyptus trees use up a lot of water during their lifecycle. Monoculture eucalyptus plantations can reduce water levels available for drinking and agriculture (Böhm, 2009, p. 121). In this case, the CDM project, through monoculture eucalyptus cultivation, used up water resources that might have been taken for granted before. This CDM project needed to enclose groundwater in order to function and create profit for the project developers. Critics of monoculture forestation projects also highlight the dangers these projects pose to biodiversity, citing a marked absence of specific flora and fauna from particular project sites (Pearce, 2019). Furthermore, these projects often emphasise cultivation of trees, such as eucalyptus or rubber, that can later be harvested for profit, perhaps negating the purpose of the reforestation projects in the first place (Pearce, 2019). In examining the CDM project, Böhm points to issues arising from the pulp mill itself. Pulp and paper mills often have deleterious effects on the communities they operate in, spewing noxious air pollutants, much like the Gujarat HFC-23 project noted above, and generating waste effluent (Böhm, 2009, p. 122). Declining air quality around project sites is a problem in many of the other CDM projects described below. Another problem with the mill is the volatility of bleaching agents used in the pulping and papering process that expose workers to the potential for chemical burns, suffocation or worse if the agents are not handled properly (Böhm, 2009, p. 123). All told, Böhm suggests that we examine whom benefits from the CDM process in the Botnia case. A Finnish firm owns the mill in question. Any proceeds from the CDM project will fill their coffers while it is not apparent that the Uruguayan community hosting the mill is benefitting much from its operation by virtue of the mill's location within one of Uruguay's free trade zones, unburdening Botnia from "national taxes" or "other unwanted costs." (Böhm, 2009, p. 124) Pollution from the mill often drifts over to communities on the Argentinian side of the Uruguay River, frustrating the Argentinians (Böhm, 2009, p. 125). Botnia benefits from a reduced tax bill in Uruguay while Uruguayan diplomats negotiate with Argentina, ostensibly on Botnia's behalf. In this case, the CDM enabled the enclosure of the water commons used in the area for drinking and agriculture. Air quality diminished because of the project, further affecting those who work and live downwind of the mill.

The absurdity of CDM finance being directed to dirty pulp and paper operations and having it be considered "clean development" aside, one example of the CDM finance being used to support a wind power operation in India also generated negative outcomes for the community that hosted the project. Mate & Ghosh described MSPL Ltd., which assisted the "State of Karnataka – and India as a whole – in stimulating and accelerating the commercialization of grid-connected renewable energy technologies." (2009, p. 154) The wind power project attempted to not only generate electricity from a renewable resource, but also attempted to increase local employment while also conserving Karnataka's natural resources (Mate & Ghosh, 2009, pp. 154-155). Regarding the former, the project did employ people, but in often unsafe working conditions. In one of the Karnataka villages, where wind turbines were being installed, a number of workers were killed in an accident (Mate & Ghosh, 2009, p. 155). MSPL Ltd. paid the families of the workers who perished (all from the local area) a small sum of money so that they would not generate negative press coverage about the CDM project (Mate & Ghosh, 2009, pp. 155-156). Those living close to the turbines were promised free access to the electricity generated by the wind turbines, but those promises never materialized (Mate & Ghosh, 2009, p. 156).

Mate & Ghosh suggest that part of the reason the project was able to continue in the face of broken promises and worker deaths was thanks in part to the project's PDD. The PDD made a number of promises regarding rural electrification, local employment, nebulous claims about empowerment and helping to conserve natural resources (Mate & Ghosh, 2009, p. 156). The PDD requires the input of local populations or their representatives, in order to mitigate obvious negative outcomes when commencing a CDM project. MSPL Ltd. did not conduct even the most basic round of communications with local populations in the Karnatakan villages (Mate & Ghosh, 2009, p. 157). As a result, very few people living close to the turbines know who is benefitting from their operation or that the origin the project stems from a global program meant to spur low carbon development in the global South (Mate & Ghosh, 2009, p. 157). The project then generated hundreds of thousands of CERs, which were selling in 2007 for €15 a unit, and made large sums of money from selling the generated electricity on the local grid (Mate & Ghosh, 2009, p. 157).

This particular project highlights the so-called dual problem brought about by CDM projects. First, if the project generated so much money from the sale of electricity, it is not clear why CDM financing would have been needed. Mate & Ghosh question why, in a context where the Indian state heavily subsidizes wind power, does the project even require CDM financing (2009, p. 157). The Indian government could have decided to finance the project themselves. As such, if the CDM project is the best way for wind power projects like this to go forward, then why are workers dying at worksites and why are the project developers failing to electrify local communities like they promised they would? Mate & Ghosh also highlighted the community's distaste for the project as the developers did not explain what the project was for or what it would disrupt (2009, p. 157). This project went ahead without much community input, again demonstrating that CDM projects can commence as long as the project developers have the financing to start the projects and without input from the host community.

Two hydroelectric CDM projects in Himachal Pradesh, India also highlight issues around proper notification to the public. Projects in Allain Duhanhan and another in Karcham Wangtoo, both located in the Himalayas began construction before any CDM financing was received and likely would have functioned regardless of financing (Erlewein & Nüsser, 2011, p. 301). In both cases, local councils and NGOs were not made aware that these dam projects were part of the CDM, and project developers only communicated with the local community once decisions were already made (Erlewein & Nüsser, 2011, p. 298). While not all community stakeholders resisted these projects outright, the outrage was evident among Indigenous peoples who felt that they were not adequately consulted, while some people living adjacent to the dams occupied project construction sites in opposition to continued construction (Erlewein & Nüsser, 2011, pp. 298-299). Opponents of the project could have made comments to the CDM EB if they knew the projects were part of the CDM. However, not having the residents know about the project suited the project developers well, since the dam projects changed the local hydrology. These projects have relatively low dam heights, which prevent displacement of settlements upstream from the dams, but the dams do dry up parts of the river, which modifies the waterway's biology (Erlewein & Nüsser, 2011, p. 299). Furthermore, the excavation that takes place as part of the construction process leaves project developers with large amounts of construction materials that cannot be easily disposed of. This disposal of this material close to the rivers increased sediment levels and deteriorated the water quality (Erlewein & Nüsser, 2011, p. 299). Project developers also brought down more trees than planned, increasing the possibility of landslides and making the land dangerous for grazing livestock (Erlewein & Nüsser, 2011, p. 299). These projects change the biology and hydrology of their areas of operation, which in turn leaves people who used the waterways previously out of a way to fish or to water livestock. These case studies demonstrated another example of a CDM project stoking green enclosure. In this case, the CDM project modified the local water system in order to generate electricity and to sell CERs much to the detriment of the local community. River waters were molested by the project upsetting a commons used by the locals in the process.

In the case of landfill gas (LFG) CDM projects, access to commons are often upended in search of profits. Many landfills in the global South are not controlled sites. This means that many landfills in the global South are open to whoever wants access (Martinez & Bowen, 2013, p. 813). Policymakers cordon off access to landfills to the public because they expose people to dangerous gases that can spontaneously combust, rodents that can carry diseases and unstable terrain that can be prone to landslides (Martinez & Bowen, 2013, p. 813). Of course, this requires jurisdictions to be adequately resourced to restrict access to these sites, something that is not always possible. This is true for many countries in the global South who lack the resources to prevent public access to these sites (Martinez & Bowen, 2013, p. 813). Leachate, the liquid runoff from landfills that naturally occurs when precipitation filters through large amount of waste, can present problems for landfills that are not properly managed (Martinez & Bowen, 2013, p. 813). To avoid becoming burdensome to host communities, jurisdictions need resources to install infrastructure that can avoid toxic leachates from polluting aquifers and local bodies of water, such as rivers and streams (Martinez & Bowen, 2013, p. 814). The same goes for the prevention of LFG escaping freely into the atmosphere and potentially catching fire. Because landfilling involves the burying of organic wastes, these products end up decomposing in an oxygen-free environment. This process is called anaerobic digestion and it creates LFG, which predominantly creates methane. This is how gasses emitted by landfills can catch fire. These fires can be exceedingly hard to battle too. For example, a landfill in Tampico, Mexico caught fire and burned in excess of 6 months before it ultimately died out (Martinez & Bowen, 2013, p. 814). This is where the CDM can assist. CDM financing can resource landfills to build gas wells and install membranes over controlled waste berms in order to capture and properly manage LFG and leachate. This is not to say that municipalities in the global South require the CDM financing to make this infrastructure upgrade possible. Rather that the infrastructure upgrade allows for an additional form of revenue under the CDM. Cames, et al. showed that there is a reasonable likelihood that these projects are additional, meaning they would not have happened in the absence of the financing (2016, p. 17). This upgrade allows LFG to be captured safely while leachate can be controlled and managed. The proper management of both of these can allow for a marked improvement in ambient air and water quality, improving the quality of life for people who live around landfills. However, this process also restricts access to the waste going into the landfill, which can deprive people of recyclable materials contained in the waste.

People who are involved in the informal recycling market by picking through waste expose themselves to a number of health risks. Schenck, Blaauw, Viljoen, & Swart point out that the United Nations Environment Programme argues that informal waste pickers responsible for the often-invisible waste management in the global South (2019,

p. 1). While this work is not something these workers would necessarily want to do if other alternatives existed, they are often compelled to by economic need, and their efforts help to manage roughly half of world's plastic waste (Schenck, Blaauw, Viljoen, & Swart, 2019, p. 1). Meanwhile, the physical rigours involved with having to move large objects on a regular basis can present issues to waste pickers (Gutberlet, 2008, p. 100). Waste pickers can suffer from musculoskeletal issues contributing to almost chronic pain symptoms (Gutberlet, 2008, p. 112). Mould, dust and other particulate matter present in the waste can increase health risks for waste pickers (Gutberlet, 2008, p. 110). Waste pickers are also often stigmatized by their communities, which increases social isolation, despite the fact these workers are attempting to conduct a beneficial environmental practice (Gutberlet, 2008, p. 112). Because workers who perform these tasks are generally on the margins of their respective societies, losing access to waste is akin to losing employment. The deployment of infrastructure at landfills to capture leachate and LFG can deprive residents of their waste streams or in some cases, will require residences to be moved so the infrastructure can be built in their place. This happened in Payatas, a neighbourhood in the northeast corner of Quezon City, in the Philippines. The municipality of Quezon City faced a dire economic situation in 2001 and the city looked for new ways to stop deficit spending (Gonzalez & Calugay, 2018, p. 25). Still fresh in the minds of city bureaucrats at that point was the disaster that took place a year earlier when heavy rain caused a landslide at an informal dumpsite in Payatas (Gonzalez & Calugay, 2018, p. 25). A portion of the dumpsite came loose on July 10, 2000 and the towering pile of waste engulfed hundreds of people who were searching for waste at the time and destroyed a number of nearby homes. The official tally of lives lost in the disaster sits at 232 (Gonzalez & Calugay, 2018, p. 32), but reports from a number of people at the site suggested that four times that number may have died in the disaster (Mydans, 2000, p. A6). The number of homes lost in the disaster sits at 655 (Gonzalez & Calugay, 2018, p. 32). People could not even collect their belongings or their deceased family members after the trash slide occurred. The LFG contained in the waste caught fire immediately after the trash slide (Mydans, 2000, p. A6).

Quezon City needed to improve its balance sheet. The city needed to find a way to ensure they could still dispose of the waste cheaply at Payatas, but they also wanted to avoid a similar disaster in the future (Gonzalez & Calugay, 2018, p. 32). Despite the fact that hundreds of homes had been buried in the disaster, there were still hundreds of homes settled close to the dumpsite. It is in this context that Quezon City looked to the CDM to improve the waste disposal infrastructure at the Payatas. In 2004, the authorities in the Philippines started the process of closing down the Payatas informal dumpsite with the provision that a new, controlled landfill would be opened nearby. The Philippine Department of Environment and Natural Resources issued the order to shut the dumpsite down, and in December 2010, the landfill that had buried hundreds, no longer accepted waste (Delos Reyes, Aspiras, & Jimenez, 2013, p. 592). The CDM project combusted the LFG produced by the organic material in closed landfill (Delos Reyes, Aspiras, & Jimenez, 2013, p. 592). Closing the old site required the relocation of roughly 1000 homes (Delos Reyes, Aspiras, & Jimenez, 2013, p. 596). This was no small feat, considering the settlements around the Payatas dumpsite comprised the largest settlement of its nature in the country (Gonzalez & Calugay, 2018, p. 32). After being relocated, the authorities argued that the relocation had unburdened these families of the “the risk of another trash slide that could bury them alive” (2013, p. 596). Of course, the homes were built up around a source of waste that provided income (directly or indirectly) for thousands of individuals (Gonzalez & Calugay, 2018, p. 33). The project developers and city policymakers knew they could not completely prevent people from going through waste taken to what would become a controlled landfill (Gonzalez & Calugay, 2018, p. 33). At the new dumpsite, waste pickers help with the diversion of certain types of waste from the landfill, but the municipality does not view the waste diversion activities of the waste pickers as significant enough to deal with the drawbacks of having those people walk around the landfill without restrictions (Delos Reyes, Aspiras, & Jimenez, 2013, p. 593).

The CDM financing for the LFG project came from an Italian company, which allowed Quezon City to obtain the necessary infrastructure without having to borrow money for it (Delos Reyes, Aspiras, & Jimenez, 2013, p. 596). It did however require Quezon City to sign a 10-year memorandum of agreement with the Italian firm providing the financing, which would be paid back through the sale of CERs on international carbon markets (Delos Reyes, Aspiras, & Jimenez, 2013, p. 596). The financing helped with the construction of the biogas plant, which commenced in 2007 and finished 2008 (Delos Reyes, Aspiras, & Jimenez, 2013, p. 595). The Payatas CDM project experienced substantial difficulties in reaching out to those who would be affected by the project. Delos Reyes et al. point out that the CDM project developers reached out to a total of 23 stakeholders from the local area as part of the CDM approval process (2013, p. 598). Those stakeholders consisted of informal waste workers, a “junkshop owner”, a homeowner close to the dumpsite, local clergy and a “parents group” (Delos Reyes, Aspiras, & Jimenez, 2013, pp. 598-599). Stakeholder discussion revolved around the risks to the local community when LFG is flared off and what would happen to those living close to the landfill (Delos Reyes, Aspiras, & Jimenez, 2013, p. 599). The stakeholders did not endorse the project, which led one local government official to blame the project developers for not consulting the stakeholders during the planning stages (Delos Reyes, Aspiras, & Jimenez, 2013, p. 599). Despite the fact that a large portion of the local community was relocated, the CDM project did provide the area around Payatas with access to electricity. Delos Reyes et al. suggest that an improved lighting system around the decommissioned dumpsite “contributed to the reduction of crimes” (Delos Reyes, Aspiras, & Jimenez, 2013, p. 599). Another advantageous point from the perspective of the project developers was that the old Payatas dumpsite would continue to produce LFG long after the site stopped accepting waste. This could be monetized through the CDM. However, there was little included in the Payatas CDM project for the people who had to move to make room for the new controlled landfill. The municipality of Quezon City lessened their financial burden, but at the cost of displacing a thousand families from their homes. This is another example of where the project developers are able to disrupt hundreds of lives in the service of avoiding emission, but also the generation of income for relatively more powerful business interests from the global North, despite complaints from a multitude of relatively less powerful stakeholders (and those complaints were echoed in the PDD). The CDM project in Payatas made the relocation of these families possible. The CDM enclosed the waste resources at the old landfill that was form of income for many, while the project developers profit off the same site where so many people perished years before.

CDM projects do not always entail the forced relocation of people from project sites. Quite often, people will continue to live close to CDM projects. What can occur is that the activity at the project site can have a destabilizing effect on local commons. The Nejapa landfill, located in El Salvador also began hosting a CDM project in 2005. The project developers signed a 20-year agreement with a handful of municipalities in the San Salvador metropolitan area, which agreed to use the landfill as the repository for their waste (Martinez & Bowen, 2013, p. 812). This CDM project planned to implement a waste to energy scheme at the landfill, which is akin to the example used above. The Nejapa case differs because no new landfills needed to be opened or closed. The CDM financing would help pay for the waste to energy infrastructure that needed to be installed at the landfill to both prevent fugitive emissions of LFG and combust the captured LFG for energy. Construction on the CDM project commenced in 2006 (Martinez & Bowen, 2013, p. 812). The second phase entailed the construction of the electricity production infrastructure, which became operational in 2011 (Martinez & Bowen, 2013, p. 812). The project developers argued in the PDD that the project could achieve a reduction of well over 200,000 tonnes of CO_2 by 2012 (Martinez & Bowen, 2013, p. 812). After meeting these objectives, the Canadian firm that installed the LFG vents and the electrification plant sold over 300,000 CERs in 2007 to the Luxembourg Government when CERs were trading for at least €14 (Martinez & Bowen, 2013, p. 812). Later, the same firm sold a larger amount of CERs to an American firm (Martinez & Bowen, 2013, p. 812). The operators of the landfill make millions of dollars every year off its operation as well through fees paid by clients who want to dispose of waste at their landfill (Martinez & Bowen, 2013, p. 813). The CDM generated profits for the involved parties, who met the requirements as stipulated in the PDD, and enabled the Nejapa landfill to cut down on emissions (Martinez & Bowen, 2013, p. 813). The Nejapa LFG CDM project generated income for project developers and improved environmental outcomes for the local community under the parameters set out by the PDD.

While the CDM project at Nejapa appeared excellent on paper, the reality on the ground was quite different. The CDM project was constructed next to one of the most economically depressed communities in rural El Salvador, where close to half of all residents live in extreme poverty (Martinez & Bowen, 2013, p. 812). Complicating matters is that the landfill in Nejapa handles relatively high volumes of waste, in a governance context where waste disposal may not occur in safe manner (Martinez & Bowen, 2013, p. 814). The project developers promised to manage leachate from the landfill carefully (Martinez & Bowen, 2013, p. 815). The residents living close to the landfill felt that this had not happened (Martinez & Bowen, 2013, p. 816). Community members argued there is no “third party” supervising the daily operations at Nejapa (Martinez & Bowen, 2013, p. 816). Because the project developers and landfill managers were motivated by profit, Martinez & Bowen suggest that these two parties allowed the environmental integrity of the landfill to deteriorate in order to seek profits (2013, p. 817). Because there is no incentive mechanism to account for the welfare of the communities living adjacent to the landfill, that the only calculus that matters in LFG CDM projects (to the project developers at least) is how CERs can be generated for the smallest amount of money possible (Martinez & Bowen, 2013, p. 817). The same is true for most other kinds of CDM projects. Landfill managers, who like the project developers, were motivated by the possibility of CER revenue, increased the amount of waste being disposed of at the landfill. The residents contended that once the CDM project began at Nejapa that there was a marked increase in trucks disposing waste at the landfill (Martinez & Bowen, 2013, p. 815). The increase in waste deposited at Nejapa meant higher levels of LFG, which could be flared for a greater amount of CERs, but also meant an increase in leachate. The water table may have been affected by the leachates with local farmers complaining that a nearby river no longer sufficed as a water source for livestock and with Nejapians concerned that local well water would be seriously compromised (Martinez & Bowen, 2013, p. 815). Other Nejapians point out that since the CDM project commenced that "Intestinal diseases, respiratory ailments, skin rashes, and miscarriages" have become more common and that children living in the community have suffered from a "disproportionate number" of ill health effects (Martinez & Bowen, 2013, p. 816).

The CDM enables a situation where project developers and other partners seek profits while the quality of life of those living close to the projects often deteriorates. The project developers argued that there would be no way that the landfill could negatively affect the local community (Martinez & Bowen, 2013, p. 815). Again, since PDDs are often accepted without rigorous vetting, the project developers were able to move ahead with the project, underscoring the lopsided power relationship between community stakeholders and the project developers. Air and water quality around the landfill deteriorated in part because El Salvador lacks the environmental governance to prevent landfills from having negative effects on adjacent communities, but also because the project developers wanted to ensure that LFG production would increase at the site. The CDM incentivized the production of LFG while doing little to prevent the landfill from degrading local air and water quality, while El Salvador lacked the controls to ensure that project developers would improve and not degrade local air and water quality. The Nejapa case highlights how the CDM provides little recourse for parties who are negatively impacted by a project, especially in jurisdictions where there is a weak institutional response to human rights abuses.

Communities Push Back

Often in situations of enclosure, resistance emerges. In cases where the CDM negatively affects commons, residents can find a number of ways to oppose enclosures. In the case of the hydroelectric projects mentioned above, local groups opposed to the projects occupied dam construction sites. In some cases, people appeal to the media to highlight the injustices that can manifest under the CDM, especially when the CDM helps to maintain a toxic status quo. Many people heard of the CDM for the first time when the story of Sajida Khan found its way onto the front page of the *Washington Post*. The *Post's* Shankar Vedantam interviewed Khan for his March 2005 feature on the Bisasar Road landfill, located in Khan's neighbourhood (2005). The Bisasar Road landfill is located in Clare Estate, a historically Indian community outside of the seaside South African city of Durban (Bond, 2007, p. 9). When the CDM project began at Bisasar Road, the community was home to thousands of African and so-called "colored" residents alike[3], following years of demographic change (Bond, 2007, p. 9). In 1980, long before the CDM was a concept, the Durban municipality in South Africa engaged in an environmentally racist policy of placing a landfill across from Khan's home in Clare Estate (Bond, 2007, p. 7). The landfill became Africa's largest, transporting waste from white areas of Durban to Khan's less wealthy neighbourhood (Sharife & Bond, 2012, p. 23). The Bisasar Road landfill also accepted waste outside of what was permitted, taking in toxic sludge and medical waste (Sharife & Bond, 2012, p. 24). Residents of Clare Estate were subjected to what one researcher called a "biological experiment", where cancer rates of those living closest to the landfill increased (Sharife & Bond, 2012, p. 24).

[3] The Apartheid government of South Africa legally defined "colored" people as mixed race, but the group itself "comprises several ethnic groups, notably including the San (bushmen) and Nama -- both indigenous to southern Africa." (AFP, 2019)

By the time Khan appeared in the 2005 *Washington Post* story she had already survived a bout with cancer (Vedantam, 2005).

The apartheid government ignored Clare Estate residents who agitated against the landfill in the 1980s (Sharife & Bond, 2012, p. 23). The African National Congress (ANC) however pledged in 1994 to close the landfill down, as it was clearly an example of the previous administration's racist disposition towards people of colour in Durban (Sharife & Bond, 2012, p. 23). The ANC broke their promise and the landfill was never closed. Sharife suggests that the global economic system, of which the CDM is part of, provided the landfill with a "logic in a depoliticized fashion." (Sharife, 2012) That is to say that the environmental racism inherent in the placement of the landfill is simply boiled down to a question of money and the resources it would take to move the landfill elsewhere now that apartheid is no more, providing the ANC with the cover not to move the landfill. Khan, a self-taught ecologist, campaigned against the continued operation of the landfill for years after the ANC's broken promise (Sharife & Bond, 2012, p. 24). It was when CDM financing for an LFG electrification project required that the landfill remain open, to maintain waste intake that would create LFG that Bisasar Road obtained an international profile (Bond, 2014, p. 165). One of the earliest investors in the Bisasar Road CDM project was the World Bank, which pledged over 14 million dollars to help the conversion needed for the gas-to-electric infrastructure (Sharife & Bond, 2012, p. 25). The World Bank was not alone in supporting the project. A representative of Lee International, a consultant in emissions trading suggested that because of a lack of recycling and composting programs in Durban that the CDM project was the only option for environmental disposal of waste (Sharife & Bond, 2012, p. 29). Later, when pressed on the phone, the consultant admitted that her knowledge of the landfill came from what she read in the media and that recycling and composting programs work in the global North but are not realistic in developing countries like South Africa (Sharife & Bond, 2012, p. 29).

In July 2006, Khan authored an "Environmental Impact Assessment critique" of the Bisasar Road CDM project, which was credited with causing the World Bank to pull funding from the project (Bond, 2007, p. 9). The LFG CDM project developers however did not plan to entertain alternatives to their project and looked to blunt Khan's activism by appealing to allies in the local area to push back against Khan's efforts. Because there were high levels of unemployment in Khan's neighbourhood, the project developers dangled jobs and bursaries in front of some of her neighbours, particularly the Black residents of her neighbourhood, if they would campaign against Khan's efforts to shutter the landfill (Bond, 2014, p. 166). An activist who organized against Khan for community employment opportunities admitted that representatives from the Durban municipality had stoked racial divisions between the Black and Indian community. The activist argued that they had been used as tools by the project developers to ensure the project could continue, even as going as far to bus allied residents to events in support of the CDM project (Bond, 2014, p. 166). The jobs and bursaries that were promised to the Black residents never materialized. Khan died from a second bout with cancer in 2007.

The case of the Bisasar Road landfill is emblematic of how the CDM enables enclosure. By providing financing to the Bisasar Road landfill, the flexibility mechanism helped maintain a holdover from the apartheid South African administration, one that was imperiling the lives of those who lived close to the landfill. The apartheid policymakers destroyed a "nature reserve" to landfill waste far from White communities in 1980 (Sharife & Bond, 2012, p. 24). The landfill was so damaging to people who lived nearby, that the African National Congress (ANC), South Africa's post-apartheid's mainstream party, dangled its potential closure as a political bargaining chip to secure votes. By providing financing to the landfill, the CDM kept it open. Khan notified anyone willing to listen that the CDM was negatively affecting her local environment, ostensibly so people in the global North could continue to produce emissions cheaply. The ANC's neoliberal approach to public policy (Bond, 2018, p. 309) pushed the administration (and municipalities under their jurisdiction) to maintain systems that could prevent unnecessary public expenditure, regardless of their origin. The CDM was an added injection of funds for the municipality, emanating from private sources, which was ideal to the ANC. This is also why the municipality looked to an activist group, which agitated for better jobs and opportunities for a Black neighbourhood in Durban, to blunt Khan's desire to close the landfill down. The activist group represented waste pickers at the landfill (among others) and tried to ensure that Black residents would have the same opportunities as their other neighbours (Sharife & Bond, 2012, p. 25). The municipality weaponised this workers group, but cynically so. In the end, the activist group was used to ensure that the CDM project could survive. Capital used the workers group to prop up its legitimacy at the very least on a local level.

Conclusion

The examples above demonstrate that in fact, these projects rely on fouling air, water and land resources in the service of creating emissions credits so that the global North can go on polluting. This is again the dual problem as outlined by Sharife & Bond (2012, p. 29). CDM projects can amplify pollution. In the case of the Botnia pulp mill, the increased funding from the CDM increased the consumption of biomass to generate electricity. Even if the biomass was not the most efficient way to produce electricity, its classification as a renewable resource meant that the mill was incentivized to burn the biomass, regardless of the pollution it would create. The same amplification of pollution occurred at the Nejapa landfill. The managers of that landfill were also incentivized by the CDM to generate as much LFG as possible, which they could later burn off to qualify for CERs. That is one side of Sharife & Bond's duel problem. The other side of this problem is that the CDM foregoes "alternative options," options that could both reduce GHGs and reduce pollution. In the case of landfills like Bisasar Road and Nejapa, recycling programs and organic composting programs, both which could increase local employment and could reduce the need to increase landfill space are supplanted for processes that might entail greater demonstrable reductions in GHGs, but might have also been avoided altogether if alternative approaches were investigated in the beginning. Because the CDM provides project developers with near total control over projects, of course it should come as no surprise that incentives to maximize a return on investment supersedes concerns around breathable air and drinkable water. Project developers say they are reducing GHGs anyway, so if there is a bit of spoiled water or acrid air as a consequence, they would argue that that is a worthwhile consequence for a system which hems in coalitions of capital that get behind emissions trading as a method of reducing GHG production.

It is not apparent that any of the operations mentioned above resulted in a net reduction of emissions. The project developers say they did and the PDDs they produced state that this would be the result of the operations at the project sites. However, the increased economic activity created by the increased traffic at landfills as a result of project developers wanting to produce more LFG, or the methane generated by damming projects cast doubt on the claims that these projects truly free up atmospheric space. The ability of these projects to cut down on GHGs aside, the power dynamic created by the CDM pits powerful capitalized interests against relatively weaker populations in the global South. The CDM's disruptive nature empowers wealthy project developers to victimize scores of people across the global South, in search of profits, often sullying commons in the process. If GHG reduction was the point of the CDM, perhaps more rigor would have been applied to the projects described above. This is not the point of the CDM, though. The prevalence of HFC-23 projects early on was proof of that. Furthermore, the lopsided distribution of CDM projects demonstrated that despite the claims that the CDM, and frameworks like it, could replace ODA, it failed to make any meaningful inroads in LDCs. Like emissions trading, the CDM is a way for segments of financial capital and industrial emitters to appear as if they are contributing to a transition away from fossil fuels.

Chapter Four – Conclusion

Since COP 21 finalized the Paris Agreement in 2015, negotiators meet on a regular basis to determine the particulars behind the Sustainable Development Mechanism (SDM), the descendant of the CDM. While the Paris Agreement did not explicitly spell out the its plans for markets post-Kyoto Protocol, Article 6, paragraph 4 denotes the creation of a "mechanism" that is to support the mitigation of GHGs while at the same time promoting sustainable development. This means that the new mechanism, the SDM, is supposed to do two things that the CDM was supposed to do. However, the Paris Agreement does not explicitly state that this mechanism is supposed to mitigate GHGs through offsetting and some interest groups, like Carbon Market Watch, argue that the SDM should not attempt to take this approach citing legitimate concerns around additionality (2017). Furthermore, since the global South must reduce their own carbon footprint under the Paris Agreement, it is likely that reductions in GHGs within their borders could go towards their own respective pledges (Ervine, 2018b, p. 88).

Negotiations taking place in Bangkok in September 2018 sought to nail down how the SDM would work ahead of COP 24 in Katowice, Poland. The negotiators discussed making the creation of SDM credits transparent, verification practices needed to certify emissions reductions projects, program oversight including the creation of a body to enforce SDM rules, how the purchase and sale of credits would affect emissions pledges and finally interlinkages between carbon pricing systems, be them ETSs, taxation systems or otherwise (Carr, 2018). Much like the CDM, negotiators representing the global South in Bangkok suggested that the SDM needed to stoke innovation within emerging markets. One negotiator representing Brazil suggested, in earnest, that the goal of the SDM should be to help every country to find their respective "Elon Musk guy," which spoke to the so-called green products that Elon Musk has marketed to consumers. However, Musk's erratic behaviour months before the Bangkok meeting might suggest that we should not be pinning our innovation hopes on the entrepreneurial class. During the summer of 2018, Musk reportedly head-butted a car in frustration on Tesla's assembly line after complaining about sluggish production speeds (Higgins, Mickle, & Winkler, 2018), then the Tesla CEO precipitated an enormous dive in his car company's stock price and the departure of two company executives by smoking a cannabis cigar on Joe Rogan's YouTube channel (Boudette, 2018).

The suggestion that we must innovate ourselves out of the climate crisis is indicative of how global climate change policy continues to hope that capital will extricate us from the impending climate disaster. Economies in the global South and North should anticipate that carbon pricing will be *the* method of putting downward pressure on emissions given the spread of pricing schemes (World Bank & Ecofys, 2018). Effectiveness of those systems (particularly market-based pricing systems) notwithstanding, this chapter will endeavour to accomplish three things. First, it will explain how the Paris Agreement distinguishes itself from the Kyoto Protocol, insofar as negotiators hope to see carbon financing deployed. Second, it will critically review the continued market orthodoxy that permeates global climate change policy. Lastly, this chapter will attempt to point out methods by which spaces that allow for social reproduction could emerge from carbon pricing schemes. Carbon pricing schemes, which deliberately attempt to provide communities with energy sovereignty, could offer up alternatives to the carbon enclosures documented so far in this thesis. This will be an attempt to argue that pricing schemes alone cannot hope to marshal societal transformation needed to extricate us from the climate crisis. Rather, I will argue that these schemes could provide communities with resources that are not subject to capital's logic, while attempting to highlight their limitations.

Goodbye Kyoto, Hello Paris

In addressing point number one above concerning the differences between the Kyoto Protocol and the Paris Agreement, readers should note that by 2015, the Kyoto Protocol splayed out over the rubble of the Protocol's flexibility mechanisms. By May 2015, the CDM and JI had flooded the EU ETS with well over a billion offsets (Ervine, 2018a, p. 700). CDM and JI generated a crippling credit oversupply and helped to keep the price of carbon on the EU ETS at levels far below levels necessary to spur decarbonization. The CDM helped to crater the price of carbon on the EU ETS and it did not channel finance equitably across the global South. Critics also panned the mechanism for human rights abuses. Despite all that, public choice theorists still argue that the CDM provides a reasonable scaffolding for the SDM to build upon. Negotiators agreed in principal to create the SDM at the 2015 Paris COP. The Paris Agreement, considered a "bottom-up" approach to climate change mitigation as it pivots on the voluntary commitments of signatories (Ervine, 2018b, p. 61), differs from the Kyoto Protocol because all signatories need to make efforts to reduce their emissions. The CDM's raison d'être was to provide greater flexibility to the global North in meeting their GHG reduction pledges. Now the Paris Agreement expects all signatories to make efforts in reducing their emissions, whether they make up the G7 or are an LDC. While offsetting could still be a conduit for jurisdictions who want to allow for flexibility in meeting GHG reduction targets, the global South will no longer be an offset generation mill for northern counties looking to avoid steep costs associated with the transition to a low carbon economy.

Many locations in the global South will take an entirely different approach to offsetting as part of the Paris Agreement, while many may continue to generate offsets as part of the global fight against climate change. Southern countries that are transitioning away from GHG emissions faster than their counterparts in the global North, or even their neighbours, will have a strong incentive to count domestic reductions in GHGs towards their own Nationally Determined Contributions (NDCs), should the agreement maintain its legitimacy among most signatories. Scholars continue to debate the adequacy of the NDCs as the Paris Agreement's policy cornerstone. Should all countries fulfill their NDCs, the expectation is that the Earth will still see warming of 2.6 to 3.1 degrees Celsius by the end of the 21st century (Rogelj, et al., 2016, p. 634; UNEP, 2018b, p. 4). Because the Paris Agreement attempts to limit "the increase in the global average temperature to well below 2 °C above preindustrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above preindustrial levels," (UNFCCC, 2015) one could argue that the agreement is already setting itself up for failure. NDCs often lack details. Many NDCs equivocate on the gases they plan to reduce or the sectors they intend to cover (Rogelj, et al., 2016, p. 632). By failing to state exactly what an NDC will do, countries increase the murkiness of global climate policy making it more difficult to plan for outcomes, good or bad (Rogelj, et al., 2016, p. 632). Availability of financial or technological support for countries in the global South increases in importance when we consider that many NDCs are conditional on assistance from wealthy countries or private capital. The UN reported in November 2018 that in 2016, wealthy nations fell far short of their pledge to provide the global South with $100 billion annually in assistance for climate adaptation and mitigation purposes (Hook, 2018). Negotiators earmarked this financial assistance ahead of the COP 21 conference in Paris (UNFCCC, 2015b). Some countries state explicitly in their NDC that implementation is entirely dependent on factors such as the finance emanating from wealthy countries (Rogelj, et al., 2016, p. 632), so if many of the NDCs are to be functional, the global North will need to meet their funding commitments. Recent history suggests however that this will not happen (Ervine, 2013, p. 657).

It is clear the NDCs are not nearly robust enough to avoid catastrophic global warming. In their annual Emissions Gap Report for 2018, the United Nations Environment Programme (UNEP) criticizes many of the G20 nations for increasing emissions despite the commitments they made in Paris. Countries with unconditional NDCs such as Argentina, Australia, Canada, EU28, South Korea, Saudi Arabia, South Africa and the United States failed to meet their recent emissions targets (UNEP, 2018b, p. 7). Indeed, by pulling the United States out of the Paris Agreement, President Trump's administration is not even trying to meet their weak NDCs. In areas, like the EU, where compliance carbon pricing has been in place for over a decade, Germanwatch notes that the EU is not on "a well-below-2°C [emissions reductions] pathway." (2017, p. 8). Meanwhile policymakers at COP24 pointed out that the EU was not on a pathway to reduce emissions to match the Paris Agreement goals or to lower emissions to a level that could keep global warming well below 2°C (Plumer & Popovich, 2018). Countries that have met their emissions targets set out in the NDCs, such as India, Russia and Turkey, may have set easily achievable emissions targets, making it much easier to accomplish such goals (UNEP, 2018b, p. 7). Furthermore, a recent slowdown of economic growth in emerging markets (Goodman, 2018) could depress emissions while making it more difficult for governments to make the investments necessary to transition away from fossil fuels.

Offsetting What? How?

The second point of this conclusion examines the market orthodoxy within the next iteration of the CDM. It is unrealistic to assume that all countries will be able to accomplish their Paris Agreement targets on their own. Countries that can make fast and drastic reductions in emissions, under their own targets may be able to profit from the sale of offsets to countries that will struggle to reduce their own emissions. Many of the negotiators involved in designing the rulebook for the Paris Agreement were heavily involved in developing and certifying CDM projects. Werner Betzenbichler, Chair of the Designated Operational Entities and Accredited Independent Entities Coordination Forum, hoped that the CDM would continue to run along with any new market mechanisms that begin once the Paris Agreement comes into effect (UNFCCC, 2018). Jeff Swartz, Director of Climate Policy and Carbon Markets at South Pole Group, a financial firm involved in consulting and providing finance to green projects (South Pole Group, 2018) argues that the CDM should be "instrumental in implementation of Article 6.4 of the Paris Agreement [and] we should not lose sight of the public money invested." (UNFCCC, 2018) Mandy Rambharos, the Climate Change and Sustainable Development Manager at Eskom in South Africa, is a lead negotiator on Article 6 of the Paris Agreement who argues that the benefits of the CDM should not be cast aside when designing tools to "incentivize climate action." (UNFCCC, 2018)

It is normal that people negotiating the successor to the CDM, would have some interest in the resulting mechanism, no matter how it looks once it enters into effect. Of course, the parties mentioned prefer to see the CDM continue with small changes, as they have the expertise necessary to navigate the approval requirements that may be superimposed over the next iteration. This thesis attempted to highlight some of the glaring issues emerging out of CDM projects and regardless of the CDM's glaring drawbacks, wonks designing the CDM's successor continue to see the CDM as a useful framework (Benites-Lazaro & Mello-Théry, 2019, p. 255). Bearing that in mind, the passion for the CDM among those who stand to gain from its continuity should come as no surprise to sober observers of market-based climate change mitigation. It is unsettling that these individuals appear to ignore the fact that the CDM failed both in its tasks of delivering clean development and in its deployment as a way to flexibly decarbonize. Ms. Rambharos' company Eskom is notorious for overpaying consultants in a scandal that continues to reverberate across South Africa (York, 2017) and helped to end the presidency of Jacob Zuma (Onishi, 2018). Eskom was also one of a handful of well-resourced actors in South Africa that were able to take advantage of CDM financing to their benefit. Eskom, a power utility with a monopoly in South Africa enjoyed "high levels of institutional access" which enabled them to obtain government support for their CDM project (Baker, Newell, & Phillips, 2014, p. 807). The project, a program that distributed energy efficient lightbulbs, helped generate income through the sale of CERs for Eskom while failing to move the utility away from coal power (Baker, Newell, & Phillips, 2014, p. 809). Eskom continued to support the extractive industry in South Africa while failing to transition towards renewable forms of energy in service of their requirements as South Africa's power monopoly (Baker, Newell, & Phillips, 2014, p. 809).

Offsetting's appeal to broad sectors of the economy continues to be one of the reasons it survives despite the documented shortcomings. If we look beyond the 2020 implementation of the Paris Agreement, international agreements like the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) will likely require large amounts of offsets to ensure that the scheme can achieve its targets. CORSIA is a United Nations scheme to offset any growth in air transport emissions after 2020. The air transport sector contributes to climate change by emitting CO_2, along with NO_X, SO_X, H_2O vapors, soot, triggered contrails and contrail cirrus while being responsible for almost 5% of radiative forcing (Scheelhaase, Maertens, Grimme, & Jung, 2018, p. 55). Since the air transport sector anticipates yearly growth rates of 3–5 percent, aviation will most likely be a net buyer on the market for emission permits in the near future (Scheelhaase J. D., 2019, p. 70). Companies and individuals that rely on air transport services will likely place enormous pressure on policymakers to ensure that carbon pricing through CORSIA does not significantly increase airfares. This means that policymakers will likely look to the seriously flawed CDM and JI markets (or eventually their successors) for a cheaper path to compliance as the air transport industry grows (Ervine, 2018b, p. 113). The air transport industry must also grapple with uncertainty around what would constitute applicable offsets as the International Civil Aviation Organization (ICAO), the UN body charged with developing and implementing CORSIA, has struggled to determine what would constitute an eligible offset at COP24 in Poland (Carbon Pulse, 2018a). Regardless of the uncertainty, developers still plan to develop offsetting projects they believe CORSIA would accept once the rules are finalized (Carbon Pulse, 2018b). This could increase the possibility of offsetting projects generating credits that may not be worth money should the finalized rules disqualify them. Concerns around “hot air” offsets, that is offset credits generated from projects with questionable additionality, persist as well. PCT academics continue to brainstorm about ways that policymakers can “operationalize” additionality, hoping that enough “bold” tinkering with offsetting rules can ensure that offsetting remains a viable decarbonisation method in the years ahead (Michaelowa, Hermwille, Obergassel, & Butzengeiger, 2019). Meanwhile, Delta Air Lines, one of the largest airlines in the world, announced in February 2020 that they would invest “$1 billion [USD] over the next 10 years,” to mitigate emissions (Delta Air Lines, 2020). Delta planned to accomplish this by “driving innovation, advancing clean air travel technologies, accelerating the reduction of carbon emissions and waste, and establishing new projects to mitigate the balance of emissions.” (Delta Air Lines, 2020) They also stated that they would reduce “reliance on today’s limited carbon offset markets.” (Delta Air Lines, 2020)

Next Steps

The third and final point this concluding chapter wants to make is that carbon markets are likely here to stay. This thesis has attempted to show the powerful coalitions of support continue to press for their existence as the best means of decarbonization. These coalitions, for the most part, succeeded in implementing the most market friendly form of carbon pricing across most jurisdictions. As the climate crisis gets more dire, policymakers will need to scramble into their toolbox of emissions pricing schemes with the hope they will deliver humanity from the worst effects of a changing climate. Of course, the coalition that supports climate pricing is by no means ironclad. Supporters of carbon pricing are currently dealing with pushback in locations that have the policies in place. The Government of Canada levied large industrial polluters on January 1, 2019

(Radwanski, 2019). By April 2019, every province in Canada had to place a price on carbon or take on the federal carbon tax. The levies encountered considerable resistance from a bevy of conservative provincial leaders who are fighting the Liberal government's carbon pricing plan in court. Experts expect that the conservative premiers will lose the court battles over the pricing plan (Rolfe, 2018). The federal government has already won court battles in Ontario and Saskatchewan in 2019, after judges agreed that the carbon tax is constitutional (Rabson, 2019). However, legal victories for Trudeau may be pyrrhic if conservative politicians are able to mobilize effective resistance to carbon pricing. As of writing, the premiers of Saskatchewan, Manitoba and Ontario have said their provinces would not implement a price on carbon, which means that the federal government placed prices on carbon in those jurisdictions. Alberta's reticence to place adequate prices on carbon means that it falls into that same framework on January 1, 2020. It is easy to imagine aforementioned politicians on the right pushing back against carbon pricing, indeed the economic collapse brought forward by the COVID-19 pandemic increased calls to do away with a national price on carbon (Bryden, 2020). However, there is also a significant constituency of resistance to carbon pricing on the left. Critics suggest that carbon pricing acts as neoliberal strategy to mollify radical movements that offer pathways out of the climate crisis, such as systemic change.

When considering popular resistance to fuel prices France's recent experience with the so-called Yellow Vest uprisings show that carbon pricing risks negatively affecting vulnerable populations. The popular uprising began in fall of 2018, with French motorists protesting a fuel tax and in January 2019 protests continued across the country, beguiling President Emmanuel Macron who was not able to effectively negotiate with protesters (Kostov & Dalton, 2019). The uproar in France that emanated from a fuel tax, which could have added close to 10 cents (CAD) a litre on fuel prices (Nossiter, 2018) demonstrates a number of issues. First is the limitation of carbon pricing as a means of decarbonization given the policy's unpopularity with large swaths of society. Policymakers can and should explore the possibility of regulation as a means of rapid decarbonization. Ontario's decision to phase out coal as a means of power generation reduced electricity sector GHG production by 87 percent between 2005 and 2015 (Wilt, 2019, p. 32). This policy helped to reduce carbon emissions by 28 megatonnes (MT) (Wilt, 2019, p. 32). Compare that with a carbon price of $50 per tonne across Canada (expected by 2022), and the expected annual GHG reduction could be around 10 to 15 MT (Wilt, 2019, p. 32). Indeed, should Canada expect to achieve annual reductions in GHGs of around 205 MT annually, an amount necessary to achieve their NDCs, carbon prices need to be closer to $250 per tonne of CO_2 (Wilt, 2019, p. 32). Higher carbon prices likely mean that households will pay more for everything, which could spark a populist backlash in Canada, not unlike the ones that roiled France, Chile and Ecuador. Since 44 percent of working Canadians live paycheque-to-paycheque (Wilt, 2019, p. 33), increased prices on fuel, food and heating could be politically toxic. While conservative Canadian politicians are influenced by climate denialism and patronized by extractive industries (to say nothing of centrist politicians and their friendly relationships with extractive companies), their critiques of carbon prices being overly onerous for large swaths of Canadian society will find, if they have not already, receptive audiences (Mosleh, 2019; Wilt, 2019, p. 33). Observers of the Canadian energy industry should know that it is also unlikely that even an event like the COVID-19 pandemic will sufficiently push Canada away from oil extraction. Indeed, in April 2020, Newfoundland and Labrador begged the Canadian government to facilitate oil exploration (Graney, 2020), and Jason Kenney sputtered that he would not for a second entertain "pie-in-the-sky ideological schemes," such as the so-called Green New Deal (Heidenreich, 2020). At the same time that politicians in oil producing provinces fulminated about the state of their petroleum industries, Canadian oil prices fell to negative levels.

Carbon pricing can be deployed in a way that is perilous for the policymakers rolling it out (and often burdensome for vulnerable populations shouldering the costs). Across Canada, the *Greenhouse Gas Pollution Pricing Act* enacted by Justin Trudeau's government allows provinces to pursue a pricing scheme of their choosing provided they meet the guidelines laid out in the Act. This means that provinces can implement a carbon market or can tax carbon emissions, with the former generating more opportunities for carbon offsetting. Quebec and Nova Scotia both have carbon markets in place while Alberta has some elements of a carbon market blanketing part of their economy (The Canadian Press, 2020). Every other jurisdiction in Canada currently has a carbon tax in place (The Canadian Press, 2020). Proceeds coming from pricing schemes can be used to reinforce or develop commons. Ervine examined the state of California's carbon pricing scheme, which channeled revenues from the scheme into the California Climate Investments Program (CCIP) (Ervine, 2018a, p. 704). The CCIP states that their program puts scheme funds towards "reducing greenhouse gas emissions, strengthening the economy and improving public health and the environment—particularly in disadvantaged communities." (State of California, 2019) While the CCIP financed a range of projects, such as public transportation, renewables deployment and other projects, of particular interest to Ervine was the CCIP's rollout of home solar systems in thousands of low-income households in cities like Fresno and Sacramento (2018a, p. 705). Estimated savings generated by the solar systems on home energy bills ranged from

75 to 90 percent (Ervine, 2018a, p. 705). A similar program existed in Nova Scotia where the government commenced the Community Feed-in Tariff Program (COMFIT), which allowed “First Nations, coops, municipalities, universities, non-profits, and Community Economic Development Investment Funds” to invest in renewable forms of energy production with promises of guaranteed returns (Ervine, 2018b, p. 151). The provincial Liberal government eventually shut down the program, but not before it allowed a number of disparate entities build support for involvement in the production of renewables and increased Nova Scotia’s renewable electricity production from 8% in 2005 to 28% in 2016 (Ervine, 2018b, p. 151). While the rollout of solar systems to disadvantaged communities in California and increased community control over renewable energy sources in Nova Scotia is unambiguously good, hostile governments often scuttle these programs. The Nova Scotia Liberal Party did in the case of COMFIT, making it harder to rely on them as a legitimate way to build energy sovereignty in disadvantaged communities. Ervine argues that these programs survive when they have grassroots support (2018b, p. 178), specifically when these programs open up opportunities for social reproduction (2018a, p. 705). In citing De Angelis’ notion of commons and enclosures, Ervine argues we should see these programs as “spaces within which the logic of capitalism can be challenged,” even though they emerge from neoliberal funding sources, like carbon markets (2018a, p. 705). That said, it is not even clear if carbon pricing systems spur the implementation low-carbon technologies in their host jurisdictions (Teixidó, Verde, & Nicolli, 2019, p. 10).

The End

It is 2020 and present in everyone's mind should be how small a window we have to rapidly transition away from fossil fuels. In 2018, IPCC stated that we have less than 11 years before anthropogenic activity stokes global warming 1.5°C above preindustrial levels (IPCC, 2018). As stated in the introduction, we are already seeing the effects of a world that has heated up to 1°C above preindustrial levels. Unusually strong droughts, heatwaves, tropical cyclones and floods have already become commonplace and will get worse. My home province of Nova Scotia will suffer greatly from a changing climate, with a rise in sea-level of about 50 cm in Halifax, by 2100 (Bush & Lemmen, 2019, p. 389). Bush & Lemmen expect similar conditions across Atlantic Canada (2019, p. 389). It is not an overstatement to stay that humanity is at a crossroads. We either act now to rapidly reduce the emission of GHGs or suffer the consequences. Of course, the situation is far worse in the global South where the rigours of climate change will be magnified. The global South has understandably less tolerance to sacrifice as much as the global North should, and even if all countries meet their goals under the Paris Agreement that we can still expect to overshoot 2°C of global warming by a dangerously wide margin. We obviously need collective action to combat this issue, but if this document has attempted to demonstrate anything, it is that climate pricing alone will not be enough and could make things worse. There are still plenty of world leaders in the global North and the global South who perceive climate change as some grand hoax – a ploy meant to trick policymakers into questioning capitalism. Many of the politicians who take this approach are also at the end of their careers if not in the twilight of their lives. World leaders like Donald Trump will be dead before the climate crisis becomes more miserable than it already is. Narcissists like Trump also mistake the end of their lives for the end of the world (Roth D. , 2018), but when they are gone, billions of human beings will continue to grapple with the consequences of their lifestyles and inaction. Unfortunately, for everyone else, a pitched battle awaits those who favour actual alternatives to capital and those who see it offering us legitimate pathways out of the climate crisis that is bearing down on all of us. Carbon pricing can help to lower emissions, but only under extremely stringent circumstances.

This document attempted to demonstrate that over a decade of carbon offsetting has not brought us any closer to avoiding ruin; in fact, it may have increased the abundance of HFC in the atmosphere (Stanley, et al., 2020). Beyond that, this thesis has also gone to some effort demonstrating that offsetting mechanisms like the CDM simply open up the global South to carbon enclosure, creating untenable circumstances for the communities dealing with the projects that vulnerable populations usually have little say about while forgoing safer alternatives. Pinning our hopes on market-based carbon pricing alone to solve the climate crisis would be a dangerous mistake. If carbon markets do survive, which they likely will, policymakers should do everything in their power to make sure that offsetting does not.

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