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ENVIRONMENTAL GOVERNANCE IN THE CARBON
ECONOMY: REGULATING GREENHOUSE GAS EMISSIONS
IN CALIFORNIA'S CAP-AND-TRADE PROGRAM

DISSERTATION

A dissertation submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy in the
College of Arts and Sciences at the University of Kentucky

By

Patrick McGregor Bigger

Lexington, Kentucky

Director: Dr. Susan Roberts, Professor of Geography

Lexington, Kentucky

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ABSTRACT OF DISSERTATION

ENVIRONMENTAL GOVERNANCE IN THE CARBON ECONOMY: REGULATING GREENHOUSE GAS EMISSIONS IN CALIFORNIA'S CAP-AND-TRADE PROGRAM

Since 2006 California has been pursuing the most ambitious climate change policy in the United States, implementing a suite of greenhouse gas reduction measures ranging from automobile refrigerant disposal rules to clean energy standards for electric power utilities. The most significant of these measures is the creation of a cap-and-trade program. Through this program, regulators seek to create a knowable price-signal to incentivize emissions reductions among polluters. Using a suite of ethnographic methods, this dissertation looks at the people, ideas, and institutions that have been mobilized in the creation of California's cap-and-trade program.

Substantively, the dissertation engages with three key aspects of the program. First, the way that economic theory is deployed in the creation of the rules of exchange, and how that theory is made to take a compromised but still structuring role in light of the political pressures on regulators in writing the rules of exchange in financial representations of greenhouse gases. Second, the dissertation examines the diverse values, economic and non-economic, in play during the creation of financial representations of greenhouse gases; and third, the environmental and social justice ramifications of structuring an emissions reduction program around the motivation of doing so at the lowest possible cost to polluters.

Theoretically, this dissertation is informed by political ecology on the commodification of nature, commodity theory drawn from economic geography and political economy, and sociological theories of economic practice primarily originating from the social studies of finance. The conclusion of the dissertation is that the result of countless hours of work by regulators and their interlocutors is a suite of market-like mechanisms that ultimately function more like the administrative tool that environmental markets' early advocates envisioned rather than the full-blown financialization of the atmosphere, though with potentially detrimental environmental impacts for vulnerable communities.

KEYWORDS: Climate Change, Governance, Cap-and-Trade, Markets, Financialization of nature

Patrick Bigger

Student's Signature

April 29, 2015

Date

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For my parents

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Chapter 1: Regulating Climate Change with Market Mechanisms

Climate change is, perhaps, the greatest collective challenge humanity has ever confronted (McKibben 2012). It is complex, multifaceted, rife with uncertainty, and its potential impacts are truly terrifying- so terrifying that wide swaths of the global north have simply chosen to pretend it doesn't exist. The facts are sobering. The globe has warmed by nearly a full degree Celsius on average since 1900, with key areas of the world, such as the polar regions, experiencing as much as four degrees temperature increase (IPCC 2014). Without a serious reduction in our emissions, the world will warm by up to 6 degrees by the end of the 21st century. The terrestrial changes engendered by changes in our climate system are as diverse as they are dire. On the whole, dry areas are already becoming drier as catastrophic drought intermittently appears in the world's breadbaskets from the Russian steppe to the US Midwest. Coastal areas across the planet are being visited by all manner of devastations. Shorelines are eroding under the steady, seemingly inexorable rise of the tides, a situation only made worse by more frequent, more severe tropical and sub-tropical storms. The seas themselves are growing warmer faster than the air temperature is rising, and are becoming slowly more acidic as their very chemical change with more dissolved carbon. While our collective knowledge of the impacts of climate change is still evolving, we have known that climate change was an extremely serious problem for nearly 30 years (WMO 1986), and a potential danger for over a century (Pittock 2010). Yet our political, economic, and social responses to climate change have been painfully slow in coming.

Part of what makes climate change so difficult to do anything meaningful about is the simple fact that it is not just an environmental problem. Climate change challenges every institution and facet of contemporary life. It is simultaneously a political problem, an economic problem, and above all, a deeply social problem; the challenge of doing anything about climate change is a problem of fundamentally reconfiguring 'the social', writ large, toward a lower carbon future. Proposals for what to do about climate change range from the most modest lifestyle changes, like consumers in the global north switching to higher efficiency light bulbs (Hirschler 2008), to growing calls for drastic emissions reductions by whatever means necessary, including the strategic degrowth the economy, a concept that is an anathema to capitalist orthodoxy (Kallis 2011).

Somewhere between these two poles lies the strategy of the US state of California. California's approach to climate change has largely attempted to find an answer to Erik Swyngedouw's question of "how to change so nothing really has to change" (2010). While as a whole the United States has largely been reluctant to commit to widespread action on climate change (though this is slowly changing), California has embarked on the most ambitious climate change policy in the western hemisphere. The state has legislatively committed to returning to 1990 levels of greenhouse gas emission by 2020, with a further goal issued through executive order of 80% reductions beyond 1990 levels by 2050. The state's strategy for achieving these reductions hinges on a diversity of tactics with a single overarching goal: to decouple economic growth from climate pollution. The tactics being employed in California are manifold. They range from material interventions by the

state into its polluting landscape, from spectacular transportation infrastructure projects to funding insulation retrofits in low-income apartments. But the tactics also include a sprawling suite of policy measures aimed at reducing emissions from every industry in the state. These policy measures are almost dizzying in their diversity and scope. They include programs for recycling automobile refrigerants, standards for renewable power generation, and enhanced planning guidelines to encourage low-carbon urban living. All of these policy interventions, however, rest on a single backstop for ensuring that aggregate emissions reductions actually take place: a cap-and-trade market. This market seeks to reduce emissions at the lowest cost to the economy as possible by putting a specific price on climate pollution. Cap-and-trade creates financial representations of the right to pollute that can be traded like other financial instruments, allowing polluters that can reduce their emissions more cheaply to do so, while those that cannot are able to purchase credits to account for their polluting activities.

This dissertation is concerned with the principles, practices, and people that have been mobilized in the creation of California's climate pollution market. It is based on over 14 months of fieldwork in Sacramento, the capital of California. Sacramento is the administrative hub of the most populous state in the US, situated about 100 miles east of San Francisco and nestled in the Central Valley between California's coastal hills and the towering Sierra Nevada Mountains, one of the most productive agricultural regions in the world. During the time of my fieldwork, California was in the midst of the most severe drought in recorded history (Roberts 2014). I can count on two hands the number of times it rained during my stay from

April 2013 to May 2014. There was widespread popular consensus that the drought was, if not caused by, certainly exacerbated by climate change. While it is impossible to attribute any single weather event to climate change (IPCC 2014), it is indisputable that climate change is part of the zeitgeist in Sacramento, with water rationing, air quality warnings precipitated by auto exhaust and blowing dust, and daily news about towns and fields that had simply run out of water. The severity of the situation is not lost on state legislators or regulators- in the 2015 legislative session more than 40 bills broadly related to climate have been introduced (Costantino 2015). Many of these bills relate specifically to the cap-and-trade policy.

If any of those bills pass, the implementation of their provisions will likely fall to the California Air Resources Board (ARB), a sub-agency of the California Environmental Protection Agency that was largely tasked with the creation of cap-and-trade along with implementing many of California's other climate change policies. While little known outside of California, ARB is as close to a household name as it gets in a state renowned for administrative sprawl. This is largely because of California's long struggle to come to grips with air pollution, most dramatically illustrated by infamous pictures of smog obscuring the skyline in the Los Angeles basin. The fact that LA is no longer the smog-choked poster child of American's indifference to environmental problems is largely a result of powers granted to the Air Resources Board and subsequent policy innovations ranging from shared governance with regional air quality management districts to the most strict automobile fuel efficiency standards in the US. One of my informants who works in regulatory relations for the transportation sector, which is subject to perhaps the

widest diversity of regulatory oversight and rules promulgated by ARB, went so far as to call the politically appointed Chairman of ARB, “the most powerful person in the state of California. She could shut down California’s entire economy tomorrow” (Sacramento, May 2013).

The tethering of environmental, political, and economic issues exemplified in the transportation lobbyist’s quote lies at the heart of the analysis offered in these pages. I want to explain how the state is using political power to foment changes in the economic geography of California to achieve environmental benefit through the creation of a set of interlocking institutions that make it possible to buy and sell financialized representation of climate change gases. Further, I want to explore what impacts these interventions have had so far. I have come to conceive of this project as a sympathetic critique of the program enacted by the 1,000 or so individuals who have had a hand in the development, implementation, and operation of cap-and-trade. I most certainly do not want to demean the Herculean task asked of regulators and their environmental, business, financial, and political interlocutors in creating, effectively from scratch, a comprehensive climate change policy that is desperately needed.

In that spirit of appreciation, there are two overarching interventions I want to make, one following from the other. The first is primarily targeted at other heterodox economic social scientists and political ecologists. After engaging with the development and implementation of this plank of California’s climate change program for the better part of four years, I will argue that cap-and-trade is best

understood not as a financial market through which money and commodities circulate in the classic M-C-M' model of the value form of capitalism. Instead, cap-and-trade operates as an administrative program that creates permits that are not commodities, which then are so constrained by the state in the way they can circulate that the overarching institution that encompasses them is not really a market. Flowing from these observations, there are a number of political conclusions to be drawn in relation to the efficacy of using market-like mechanisms to come to grips with climate pollution at any spatial scale. First, if we recognize that cap-and-trade is primarily an administrative, which is to say rather more political than simply economic, project to put a price on a carbon, then the price thereof is subject to contestation and ultimately administrative determination. Second, it means that the intensive work required of regulators and their interlocutors to build a market-like apparatus that ultimately does the same work of more administratively simple measures like a carbon tax or cap-and-dividend could be deployed elsewhere to more closely regulate other environmental problems, or even other facets of climate change, contingent, of course, on weakening the neoliberal orthodoxy of markets for the sake of markets.

I make these arguments drawing on diverse bodies of literature in addition to my extended ethnographic engagement with regulators and a close reading of the text of the regulation that structures cap-and-trade. First is critical work in geography and allied disciplines on market environmentalism, sometimes collectively called 'neoliberal environments,' (Heynen, McCarthy, Prudham, and Robbins 2007) that often claims the mantle of first-world political ecology

(McCarthy 2005). This work generally includes engagement with heterodox political economy to critique orthodox economics and especially its application to environmental problems (Peet, Watts, and Robbins 2009). Second, I draw heavily on disparate literatures across social science disciplines that are attuned to the *performance* of the economy; in geography this is generally referred to as cultural economy (Hall 2010), in the sociology of markets it goes by the name of social studies of finance or performativity studies (See, for example, Callon 1998, Çalışkan and Callon 2009, 2010, MacKenzie 2009a). Finally, my work relies on neoclassical economic theory itself as a way to understand the ideological underpinnings of carbon markets. While I do not seek to contribute to this literature, it is the dominant social science discipline in play in the creation of California cap-and-trade even if its specific contributions are sometimes obscured in the regulatory process. However environmental policy often becomes a matter that appears more like industrial, and hence economic, policy, and because some key debates discussed at length in the following chapters are specifically framed in terms of efficiencies and opportunity costs, my work is necessarily attuned to (neo) classical economic thought.

In this introductory chapter I first will set the stage for subsequent analysis by providing a brief overview of the scholarly literatures from which I draw and to which I contribute. I will review the history of market environmentalism, of which California is ostensibly a part, and a discussion of the use of climate markets worldwide to date as well as a brief explanation of how cap-and-trade programs are thought to work. This is followed by a summary of California's environmental

regulatory history that been at the forefront of rule-making in the United States and the legacy of which, in large part, animates politicians' and regulators' drive to demonstrate leadership on climate change. I will then summarize each of the three primary substantive chapters that comprise this dissertation and discuss the methods used in each to make the arguments. Following this introductory chapter, Chapter 2 provides a thorough overview of all of the moving parts of California's cap-and-trade regulation that will be of use for understanding the contributions made in the later chapters.

A brief history of California environmental policy

California has a long, proud history of being at the forefront of environmental regulation in the United States. Although the agency was not formally established until 1991, most of its constituent functions, including the Air Resources Board, existed for decades (California EPA n.d. a). The Air Resources Board itself was established in 1967 when the state legislature combined the Bureau of Air Sanitation and the Motor Vehicle Pollution Control Board, both which were housed in the Department of Health (California EPA n.d. b). While housed in EPA now, multiple ARB staff reminded me that the Board's primary missions remained public health. Even before the formal creation of the ARB, the state established the first automobile emissions standards in 1966 (California EPA n.d. b). The following year the Federal Government granted California authority to define and enforce automobile emissions standards separately from federal rulemaking, a provision that remains in place owing to California's particular circumstances. California has long has the most total vehicle miles traveled of any state in the country for most of

the existence of the automobile. The development of the state around single passenger transportation and has led to the low density residential patterns.

From its beginning, air pollution control has been a matter of decentralized governance in the state. California has a high degree of shared authority between state agencies and regional or county level authorities. The tasks of on-the-ground policy implementation and enforcement often fall to local officials. This dates back to the original structure of the state apparatus in general, but is manifest in the fact that the newly formed Bureau of Smoke Control in the city of Los Angeles pursued the state's first smog control program in 1945. Within two years, the governor mandated that every county in the state form an Air Pollution Control District (ARB n.d.). These were eventually supplanted by Air Quality Management Districts, bodies that ARB continues to share governance on air quality with, including coordinating action on greenhouse gas emission verification. Other major achievements in air pollution control by the state included a state-level 1988 Clean Air Act that became the basis for the federal 1990 Clean Air Act Amendments, the introduction of the RECLAIM market in the South Coast Air Quality Management District (discussed below as part of California's experience with market mechanisms for environmental ends), the adoption of a policy in 2001 that requires all new regulations to consider the environmental justice ramifications of implementation, and a standard passed in 2004 that required car makers to start reducing the greenhouse gas emissions from their vehicles by 2009. Despite all these measures, it is worth noting that areas of the state continue to have some of the worst air quality in the United States, particularly in the Central and San Joaquin Valleys, and in low income urban areas in

both Southern and Northern California (OEHHA 2014). The severity of ongoing pollution has been a question for groups trying to influence the cap-and-trade regulation, as green groups have argued that the state should use their powerful surveillance and regulatory power to regulate toxic substances that are emitted along with climate change gases as discussed in Chapter 5.

The use of market mechanisms for reducing airborne pollutants

While California has long been at the forefront of environmental regulation in the US, its use of market mechanisms to deal with climate change gases is far from unprecedented. The idea of using a market to rectify environmental problems traces its intellectual heritage to Coase (1960) and Dales (1968), following the insights of Walras (1898) and Pigou (1920). While classical economics provides many of the tools that economists use to think about managing the environment, it treats the environment (except for resources) only as an external force that impacts human economic activity (Gammon 2010). The work of Coase and Dales showed economists how to treat the public goods nature provides as something that could be brought to the market like any other commodity, while accounting for externalities, or the unpriced damages that occur as a result of production. These externalities could, theoretically, be any kind of environmental (or potentially even social) problem. Coase's initial article used the somewhat curious example of noise (1960), while Dales more directly confronted the problem of environmental externalities discussing point-source water pollution (1968 a, b).

By suggesting that nature, and by extension, environmental quality could be traded as a commodity, Coase and Dales created a new conceptual framework that directly led to theoretical experimentation in environmental markets in air quality in the 1970s; markets now exist for water quality, water temperature, wetlands, endangered species habitat, and a host of other “ecosystem services” (Daily et al. 2000). Dales (1968b) was careful, however, to note that a market in environmental quality would not be a ‘natural’ market because market demand had to be created by regulatory action. This certainly true of carbon markets (Tietenberg 2006), and the complications that arise from having a commodity that is composed, in part, of a use-value that is simply compliance with regulatory mandate is discussed in Chapter 3.

As Calel (2011) demonstrates, it is difficult to say what the first market in airborne pollutants actually was. Emissions trading seems to have first been conducted when the US EPA began allowing individual companies to pool their emissions quotas between different facilities in the early 1970s, formalizing the practice in the 1977 Clean Air Act Amendments (Calel 2011, 12). The practice was expanded to allow averaging between facilities that produced leaded gasoline, and then further extended the practice to include the US’s contribution to global CFC production as a way of meeting the requirements of the Montreal Protocol for protection of the ozone layer. This evolution comprises a fascinating intellectual history by which environmental problems became reframed as matter of economic concern, largely because, at least in the United States, polluters balked at the cost of cleaning up all manner of pollution that had previously been unregulated. The

intransigence on the part of polluters, which represented a number of power industries increased commensurately as the scale and scope of environmental problems became better understood and more well known following the advent of the environmental movement in the US. Popular pressure resulted in a growing level of government resources directed not only at environmental regulation by environmental science and surveillance that began to demonstrate the severity of a number of environmental problems, ranging from DDT as related by Rachel Carson in *Silent Spring* (1962) to the discovery of the ozone hole (Steps 2008).

Following this series of limited experiments with tradable permits in air pollution, the 1990 Clean Air Act Amendments under the George H.W. Bush White House created the US Acid Rain program, which, in retrospect, has been called, “the grand policy experiment” (Stavins 1998). Bush specifically set out to become “the environmental president”, but this urge was coupled with the increasing orthodoxy of free market economics ushered in by his predecessor, Ronald Regan, who, coincidentally, as governor of California created the forerunner to Cal/EPA. In another interesting confluence of actors, the primary non-governmental supporter of the use of markets in reducing acid rain was the Environmental Defense Fund (EDF) (Conniff 2009), which authored the draft text of AB32, The California Global Warming Solutions Action of 2006 that authorized the creation of California’s carbon market.

The acid rain market, referred to in California as the Regional Clean Air Incentives Market (RECLAIM), covered emitters of both Nitrous Oxides and Sulfur

Oxides in separate markets, with the NO_x markets being the larger of the two. While the RECLAIM market was spatially limited in contrast to the theoretical infinite scalability of carbon markets because of the physical properties of the gases under management, California's SO_x and NO_x markets became the most significant market mechanism for environmental mitigation attempted at the time. The program got off to a slow start, as businesses were reluctant to buy financial instruments that effectively derived exchange value exclusively from regulatory mandate. This problem was solved through further mandate, when the federal government forced the TVA to purchase credits. Within five years, the program had achieved full compliance (Calel 2011, Reynolds 2013). Proponents of market environmentalism point to RECLAIM as a proof-of-concept for the economic efficiency of cap-and-trade programs, claiming that compliance costs among polluters was around \$3 billion while initial projections of compliance costs from direct, or more pejoratively, command-and-control, regulations were around \$25 billion. Based on the perceived success of the RECLAIM market, the first Bush administration began pushing market mechanisms for hypothetical compliance in a global treaty to limit climate change gases. These negotiations would eventually lead to the Kyoto Protocol. While the US ultimately never signed on, the Kyoto Protocol specifically included market mechanisms as the primary compliance tool for countries to manage their greenhouse gas targets (Meckling 2011).

Since the adoption of the Kyoto Protocol, cap-and-trade markets have become one of the default policy positions for mitigating climate change. Markets are now in place or under development in more than 40 jurisdictions (IETA 2014).

California's is currently the third largest in the world after the European Union and South Korea's newly inaugurated market. The EU's emissions trading system (EU-ETS) bears further examination, in large part because its multitude of failures has had a significant impact on the design and operation of California's carbon market. While each chapter includes reference to some of these problems, it may be useful to point out these flaws in the introduction before reading about the machinery of California's cap-and-trade program.

The EU-ETS was launched in 2005 and now covers 31 countries and more than 11,000 industrial installations, almost twenty times more facilities than California's carbon market covers. While the EU-ETS covers many times more industrial installations than California's cap-and-trade program, it is not as comprehensive despite operating across all EU member states plus Norway, Iceland, and Liechtenstein. The EU-ETS only covers around half of the trading bloc's emissions, in contrast to California's 85% coverage, and part of the reason for that is the EU-ETS regulates a smaller bundle of gases than does California. While emissions have declined in the EU since the launch of the cap-and-trade program, it is unclear how much of that decline is attributable to the ETS (Kill et. al 2010) particularly in light of macro economic recession and stagnation along with other energy efficiency and supply-side programs like Germany's aggressive renewable power strategy.

The EU-ETS was designed to help member states achieve their Kyoto commitments in light of the Protocol's explicit inclusion of market mechanisms, despite the fact that many EU governments were skeptical of their inclusion in the first place, but ultimately agreed to go along with ETS approaches in hopes that it would bring the United States into the fold of regulated states (Hepburn 2007). The EU-ETS actually began several months before the Kyoto accord went into effect, and over the years the EU's system was gradually made compatible with other Kyoto mechanisms, and the Clean Development Mechanism (CDM), an offset program designed to encourage lower carbon infrastructure and industry in the global south (also referred to as Annex II countries in the language of international climate negotiations). The CDM has been an even greater disaster than the EU-ETS, with prices per ton at well under \$1. This level is generally regarded as completely insufficient to incentivize cleaner industrialization practices (Kill et al 2010).

Perhaps the greatest challenge EU regulators faced was creating and approving baseline emissions from member states in order to allocate emissions allowances (EAUs). For example, in the second phase of the EU-ETS, Bulgaria requested a cap of over 67 million tons, despite the fact that the country's 2005 verified emissions were just over 40 million tons, nearly 2 million tons under their phase one cap. However, these problems were unknown when the ETS launched in 2005, and prices on the exchanges through which EUAs changed hands peaked at more than €30 per ton in April 2006. These high prices and the pre-crisis optimism about financial markets led the US Commodities and Futures Exchange Commission,

one of the regulators of California's carbon market, to speculate that carbon was poised to become, "the worlds most traded commodity" (Mason 2009).

However, as prices were peaking, a number of member countries announced that their verified emissions for 2005 were actually less than the number of EUAs already distributed, meaning there was an absolute surplus of EUAs in circulation, and unsurprisingly prices tanked. By May 2006, the EU confirmed that it had distributed about 4% more allowances than actual emissions that had taken place in 2005, setting the stage for persistent problems of over allocation and oversupply that the market has never fully resolved. By 2007, prices of EUAs were under €0.10. Prices subsequently recovered to some degree in phase II of the EU-ETS as emission accounting became more accurate, but crashed once again as the great recession took its toll on manufacturing, reducing output and emissions. Per ton prices have not reached more than €10 since 2011, bottoming out around €2.

In addition to all these structural challenges, the EU-ETS has been plagued by fraud and graft. These are key problems in terms of their magnitude, but perhaps more importantly, for highlighting the dangers of creating financialized representations of emissions and the mistrust that malfeasance engenders among regulated industry and the general public. The first problem, and one that California has assiduously sought to avoid, was the fact that at the advent of the EU-ETS, each member state ran its own registry for carbon credits. The lack of a central repository for ownership data of emissions credits made a number of scams possible. First, in numerous instances hackers were able to gain access to national

registries and effectively steal serial numbers that represented tons of CO₂, and then resell those credits to buyers in other jurisdictions that had their own registries before the original national registry realized that credits were compromised. The security for some of these national registries was so lax that one hacker involved in stealing carbon credits observed that, "I didn't think anyone would be stupid enough to come up with that," because the intangible nature of carbon credits are such that it makes fraud more difficult to detect (Funk 2015).

Other types of fraud were rampant in the EU-ETS. Funk (2015, no page) offers this account on the scale of the graft.

In the late aughts, for instance, while carbon traders generally went through background checks in their country of residence or business, there was one significant exception: Denmark. Host of the 2009 climate conference, the country wanted cap and trade to work, and it apparently wanted to remove all barriers to success. For several years before the summit convened, all it took to open an EU ETS trading account in the Danish carbon exchange... [was] a name and an email address. Among the 1,300 people who opened accounts, as many as four-fifths of them fraudulently, was someone who gave the name of Indian poet Mirza Ghalib, who died in 1869, along with an address in a Copenhagen suburb... after Danish authorities finally began background checks in 2011, the number of registered carbon traders dropped to just 30.

California has actively sought to minimize the possibility of this type of fraud by requiring stringent registration requirements for individuals or companies seeking to participate in their cap-and-trade program. Within the EU-ETS, other types of fraud were possible that do not exist in California, most notably a scam known as VAT (value added tax) Carousel Fraud, wherein traders would sell EUAs across national borders through fraudulent accounts, transferring sometimes ill-

begotten EUAs and pocketing the VAT. At one point in 2009, EUROPOL suspected that up to 80% of volumes in EUAs might be some form of VAT fraud (Phillips 2010) resulting in substantial lost tax revenue for member states. Critically, this VAT fraud did not just include fraudsters, but the biggest financial institutions in Europe. Officials at Deutsche Bank remain under investigation by German financial officials for enabling VAT fraud for clients and the bank's own trading arm (Taylor 2012). In addition to these high-level financial crimes linked to the marketization of GHGs, low level fraud continues to be rampant as hucksters sell non-existent credits to individuals, and some of these cases involve allegations that perpetrators used funds from carbon fraud to fund international terrorism (Day and Bowdin 2014). All of this makes for a toxic image of carbon trading in the EU, which California is desperate to avoid given the popular and political support climate action current enjoys.

How does a carbon market work?

At its most fundamental level, the idea of carbon trading is that a given jurisdiction will set a cap on GHG emissions that covers some subset of their aggregate polluting economy. The state will issue a finite number of permits and distribute them to polluters. Polluters must subsequently surrender permits to compensate for their emissions. Flexibility is achieved by allowing polluters to trade permits with one another. According to economic theory, polluters who can reduce their pollution cheaply will do so, and then sell their excess permits to polluter that cannot or will not reduce emissions. In this way, emissions are supposed to be reduced at the lowest economy-wide cost, with a market creating efficiencies for

finding the lowest cost reductions available in a way that state regulation is not capable of.

The mechanisms to make a cap-and-trade program are fairly involved, but certainly intelligible just as other financial products are (Christophers 2009). In order to build a carbon market, there are a number of things that are required. First, there needs to be things (factories, power plants, refineries) that are emitting greenhouse gases and these things need to be in a defined territorial unit (a country, a state, or a supranational entity, like the EU) that has some power of regulation. The government of that territorial unit, like California, must make the decision that it is in their interest to regulated greenhouse gas emissions, and that a cap-and-trade market is the best way to go about limiting those emissions. This decision is often made with the help of lobbying efforts from any number of groups, ranging from power plant operators to environmental groups.

Once the decision is made to restrict emissions, then there are quite a few steps that must take place in order to 'make' the market, involving a range of people and institutions. First, the government must decide how much they want to reduce emissions by, and this entails negotiation between business interests, green groups, and the government. In order to determine what the cap is, the government will have to know what the existing level of emissions is, where they are coming from, and what types of greenhouse gases are being emitted. To ascertain what the current emissions levels are, the government will require individual sources, like oil refineries or glass works, to report on their emissions for past and current years.

For this step, California created a web-based reporting mechanism where companies could submit their emissions data, but that data must be checked at the point of release by verification agencies that are independent (or third party) contractors.

Once the government knows what its emissions levels are, it can decide how much it wants to reduce emissions by. The government agency in charge of emissions will set an overall limit, or the 'cap' in cap-and-trade. It bears noting here that the cap is the part of the program that actually seeks to reduce emissions, while the trade part is purely a cost reduction mechanism¹. It is helpful to think of the cap as the optimal level of pollution in the eyes of the state, balancing environmental benefit with political constraints owing to the path dependencies of existing infrastructure and political constraints imposed by fear of high economic costs. California has an overall emissions goal, but that goal is a return to 1990 levels of pollution by 2020 rather than an explicit mass of pollution as discussed at length in Chapter 5. The cap subsequently will decline at some predetermined rate, thus ratcheting down aggregate levels of allowances available, and, if the program is working, the level of emissions. In the absence of exogenous forces that drive down emissions like economic recession or structural changes in the composition of the economy, a declining cap ensures that regulated entities will have to trade with each other at some point, or that all entities will reduce their emissions. By creating a scarce resource (carbon credit) and giving them away for free, the government

¹ I'm grateful to Kathleen MacAfee for regularly reminding me of this point.

hopes that costs will not be passed on to consumers who purchase goods, like oil or electricity from compliance entities. However, free allocation processes have been linked with the extraction of substantial rents by companies participating in cap-and-trade in Europe with no savings for consumers (Chan 2009).

Compliance entities, the polluters subject to the regulation, will need to be issued carbon credits that they can use to compensate for their emissions. Carbon credits can be distributed in one of two ways- auctions or free allocation, or some mix of the two. In an auction, compliance entities would have to bid with one another to get their carbon credits, and pay the state for them. In a free allocation, the carbon credit would be given away (Tienenberg 2006). California has a mix of the two, with different industries receiving different levels of free allocation depending on a number of factors as discussed in chapters 4 and 5. The most recent auction of emissions permits in California brought in more than \$1 billion for the state, a significant sum that raises objections from anti-tax activists and climate change skeptics who argue that these fees for emissions permits constitute an unauthorized tax.

Of course, the trading of carbon credit would not be possible if it were not for the state's role in guaranteeing private property. The state must define what a carbon credit is, and make sure that it only has one owner at a time. In order to assure the owner of a carbon credit that what they have is unique (that is, not representing emissions that have already taken place, or are spoken for, elsewhere), the government must either create a registry, or contract with a company to

operates one. Whenever a carbon credit is transacted between two parties, in its creation by the state and allotment to a regulated entity, when an entity sells a carbon credit to another entity, or when an entity surrenders a carbon credit to compensate for actual emissions, that transaction is noted in the registry to prevent double counting or other types of fraud.

Another factor in determining how a carbon credit is owned lies in understanding what, exactly, the carbon credit represents. The definition of what the use-value of a carbon credit is can be difficult to come by. The use-value of carbon credits in general have been described many different ways, including the right to emit one ton of carbon, the environmental benefit that the reduction of one ton of carbon being released into the atmosphere represents, or the ton of carbon actually taken out of the atmosphere in the case of offsets. Clearly, not all the conceptualizations are the same, and have different impacts when regulators think about carbon credits in different ways. Ultimately, however, the use value of carbon credits issued in a regulatory carbon scheme is compliance with the regulation as discussed in Chapter 3. Further, carbon credits measure not only carbon dioxide, but a bundle of greenhouse gases that all have different physical properties, including how much heat they refract, how long they stay in the atmosphere, and what other kinds of detrimental effects they produce (MacKenzie 2009). The effect of these definitions is that compliance entities that can reduce emissions of molecules that have the potential refract more heat can earn more credits to sell than they would have by simply reducing carbon dioxide emissions (Hepburn 2007). While the rates at which different gases can warm the atmosphere are still subject to scientific

debate, these debates cannot necessarily be taken into consideration in the cap-and-trade market because a commodity must remain fungible with other commodities, but they are subject to reconsideration in different phases of the cap-and-trade market (Lohmann 2010a).

Despite all the scientific wrangling over what constitutes a carbon credit, compliance entities can use them to compensate for emitting one ton of carbon dioxide equivalent into the air. But what happens if a compliance entity needs to buy carbon credit because they have emitted more carbon than they were initially allocated carbon credit? In this case, the compliance entity can either buy allowances on an exchange or through bilateral transactions. The exchange can be thought of as similar to a stock exchange, in that buyers and sellers do not necessarily know one another in advance and the terms of the contract are set in advance, making the credits 'screen tradeable'. The financial products that are traded on the exchange for carbon credit are all carbon credits, but they may be for present use or for future use depending on the vintage they are assigned by the regulator. In order for carbon credit to be bought and sold on the exchange, the exchange must be designed and implemented.

In this case of California, it is purely a virtual exchange- you cannot go to the exchange, as you would the New York Stock Exchange, but it is no less real (Wojcik 2007). The function of the exchange is to match buyers and sellers of current and future-vintage denominated carbon credits. The price a buyer is willing to pay is matched with the price a seller wants for a carbon credit, and once a match is made,

the ownership of the carbon credit changes hands and it is recorded in the registry. However, this price is influenced by many factors, including political uncertainty around the status of policies, the price of oil, the scarcity or abundance of carbon credit for sale, and the total amount of money circulating in the market- if there are many speculators, or people simply buying carbon credit in the hopes of selling them for a profit later, than prices may become inflated, creating an asset bubble (Labban 2010). However, the trade in carbon credits in California has been significantly restricted to prevent all manner of malfeasance and undesirable outcomes from happening as discussed in Chapter 4.

Carbon credits can also be bought and sold over-the-counter (OTC), or through transactions that not done on the exchange, and these transactions can be either purely bilateral or include a broker. These OTC trades can be much more complicated than simple money-for-carbon credit transactions on the exchange. OTC transactions can involve current carbon credit being exchanged for carbon credit futures, or carbon credit traded for other types of financial instruments, including purchase agreements or bundling with power and energy products (Story 2010). The general idea is that carbon credit can be bundled with other types of financial instruments to hedge against the price of one of the assets going down too much and wiping out the profits that might have accumulated if the risk had been negated by holding different types of financial products (See Pryke 2007 and Randalls 2010). In order to make an OTC trade, an investor will often hire a broker, or intermediary, to structure a deal that meets their client's financial needs. Deal mediation will also usually involve lawyers to ensure that the contract is written in

such a way to comply with the rules generated by the regulator, as well as state and federal level financial rules. OTC transactions are also common in the offsets trade because of the particular conditions of their production and the limitations placed on their compliance use by the regulator.

In addition to carbon credits generated by government fiat, the other main class of carbon credits is offsets. In order to generate carbon credit through offsets, there are generally offset developers, brokers, lawyers, third party verifiers, and standards organizations. An offset developer may be approached by a Non-governmental organization (NGO), landowner, or even a compliance entity that wants to reduce emissions, or improve the earth's capacity to absorb carbon dioxide through activities like planting more trees. The offset developer will create plans to install equipment, plant trees, or whatever physical activity is required to reduce emissions. An analysis then must be created to prove that whatever activity is proposed would remove more carbon from the atmosphere than would have happened under business-as-usual conditions.

This analysis is done to create 'additionality', a highly contested concept because it relies on projecting emissions based on a future that has not, and never will occur (Gillenwater, 2012). The exact wording is that offsets must create 'real and additional' greenhouse gas reductions (Lohmann 2011). This additionality analysis must then be approved by an offset registry, and be found in compliance with accepted methodologies and accounting for the correct amount of reductions according to protocols approved by a standards setting organization. Once the

analysis is completed and the project is approved, then the project developer may do the physical work of implementing whatever project they have chosen to create offsets.

Once the project is completed, a verifier, or inspector, must investigate the project to ensure that what had been specified in the proposal has actually been done on the ground. If the verification contradicts the promises of the project's emissions reduction potential, then offsets are not issued. However, if the offsets have been issued, and then are found not to have actually taken place by a subsequent verification, then the offsets are found in the registry and are voided. If offset credits are voided, they cannot be used to compliance purposes, or sold among compliance or speculative market participants. However, if the project is approved and found to be in compliance with the offset protocol, it generates offset credits that are then fungible with other financialized representations of carbon. While these are the basics of carbon trading, the specifics are much, much more complex. These complexities will be addressed throughout the dissertation, particularly in Chapter 2's in-depth discussion of the current California cap-and-trade regulation and throughout the substantive chapters.

Methods

The arguments made in this dissertation are largely derived from 14 months of fieldwork conducted over two trips to California, the first during the summer of 2012 and the second from April 2013 to May 2014. During the course of fieldwork, I attended 23 regulatory workshops, hearings, sessions of the state legislature, and

industry-sponsored conferences. I further virtually participated in a number of web-based meetings or webinars on various topics directly relating to the operation or function of the cap-and-trade program. During each of the in-person events during which I undertook participant observation, I took thorough notes on who was present at different functions, working out the specific topical interests of many of the key regulatory and industrial personnel who were influencing the rules of the program. I carefully observed interactions between different actors not only during the hearing, but also before events started, during breaks, and in the brief periods of conversation that followed each event. While events were in session, I kept two columns of concurrent notes; on the left side of my notebook I jotted key themes, ideas, or observations about the social components of the event that was going on; on the right side I captured a summary of each speaker in addition to quotes. Participant observation proved to be my most successful data collection method for a number of reasons. The first reason is the level of familiarity that many of the actors involved in the regulatory process have with one another, a topic that will be explored in Chapter 4. This familiarity led to candor and expression that one might not expect of a high-stakes rule making process. Following each of these participant observation events, I transcribed my notes verbatim for use in coding exercises described below.

Additionally, I conducted 15 interviews targeted with key personnel in the creation and operation of the carbon market. While their names and titles largely do not appear in this document for reasons of confidentiality that were necessary to get many of the interviewees to participate at all, these conversations significantly

clarified many of the things I saw during participant observation. Interviews were conducted over periods ranging from 30 minutes to two hours depending on the participant using a similar, but customized script of 12-15 questions. Questions were customized based on an individual's position within the regulatory community. For example, many of the questions for an industrial lobbyist would not generate useful information if asked of a state legislative analyst. A sample interview script is included as Appendix A. Once interviews were concluded, I transcribed interview recordings (where participants allowed them) for using in coding. I will note here a key shortcoming of my research: I was not granted an interview by any actor with a specific financial stake in the market, nor was I granted an interview with any of the economists who serve on committees for the ARB that are contracted to do economic analysis of the program. While this information might have been illuminating, I have had to rely on secondary sources to construct these actors' positions.

While not a method per se, I gained further valuable insight into the workings of the regulatory process and the commitments of market interlocutors through informal meetings and evenings out with individuals involved with crafting the regulation. Sometimes these meetings were arranged, at other times spontaneous. While Sacramento is a city of around 1 million people, the downtown core where ARB and the State Capitol are located can feel like a small town, particularly when the Legislature is not in session. While an exaggeration, a common slur for Sacramento is to refer to it as a cow town. I often found myself surprised to be talking cap-and-trade politics in the locker room at the YMCA or at

my local bar. I treated all comments made or overhead at these informal meetings as strictly off-record, but it bears noting that they occurred and had a significant impact on my thinking about several key issues discussed here, not the least of which is the surprising friendships and alliances that the policy process can engender.

In tandem with these in-person methods, my arguments rely to a significant degree on analyzing policy documents and the public comments offered on various components of draft regulations. Additionally, I used California Freedom of Information Act requests to acquire all of the contracts the ARB entered into for the purposes of building both the theoretical and physical infrastructure of the cap-and-trade program. All told, I worked through more than 5,500 pages of policy documents, enough to fill two banker's boxes. While Chapter 5 relies most explicitly on an analysis of policy documents, for all these documents I used what Crabtree and Miller (1999) term the immersion/crystallization method of data analysis, where I code all documents for an initial set of terms, then used the NVIVO software package to search for other topics that came up with frequency that I missed in my initial coding. I explain this method in much more depth in Chapter 5.

Finally, I have assiduously followed press coverage of cap-and-trade since 2011 and have compiled a collection of more than 500 articles in that time. In order to ensure that I did not miss potentially interesting news items, I set up several web aggregators to collect articles on a real-time basis. This practice helped in several ways. First, it kept me attuned to broader trends in state policy at the legislative

level since it is practically impossible to attend all legislative subcommittee hearings that have some relevance to cap-and-trade. Second, it helped orient me as to what longstanding debates or conflicts existed among different industries or environmental groups that I might not have otherwise known about. Finally, keeping up with the press allowed me to engage in small talk with potential research participants about salient topics rather than delving straight into details, which I found to be helpful.

Summary of chapters

The three substantive chapters in this dissertation are structured around key issues in the creation of California's cap-and-trade program. Before the chapters that form the bulk of the argument presented in this dissertation, Chapter 2 is a close reading of the regulatory text by which the cap-and-trade program is governed. Next, Chapter 3 deals with the commodification of carbon, the process by which molecules of greenhouse gases emitted in the state can be turned into financial representations. Conceptually, the chapter is concerned with the production, circulation, and realization of value through commodified carbon. Chapter four investigates the marketization of carbon, or the process by which those representations are allowed to circulate between the state, industrial, and financial concerns. This chapter is concerned theoretically with reconciling cultural and political economy approaches to the performance of markets. In Chapter 5, I will examine environmental justice ramifications of using market-like mechanisms to achieve overarching emissions reductions goals. This chapter is more concerned with the political ramifications of the policy process and thinking through the role of

the state in defining what constitutes environmental justice. The arguments in each of these chapters rely, to greater or lesser degrees, on a suite of ethnographic engagements in the regulatory process. These methods, to be discussed below, include in-depth participant observation at workshops and hearings conducted both at ARB and at the California legislature, analysis of policy documents and written comments submitted by regulatory interlocutors throughout the rule making process, targeted semi-structured interviews with key personnel in the creation and operation of the cap-and-trade program, and discourse analysis of media reports and op-eds about the program.

Chapter 3 is primarily concerned with the commodification of nature, a topic that has garnered the attention of political ecologists and economic geographers of the environment for most of the 21st century (i.e. Bakker 2004), but reaches back to the early 1970s (Peet 1973, cited in Robertson and Wainwright 2013). The primary argument in this chapter is that the creation of financial representations of greenhouse gases in California does not represent, in Neil Smith's (2007) words, the real subsumption of nature by capital, but rather an administrative program that acts as a barrier to production (see also Felli 2014). The chapter further contributes to heterodox economic understandings of value, seeking to expand conversations about the value(s) present in environmental markets beyond just the economic (Graeber 2001) and to interrogate the irreconcilability of use and exchange value in regulatory financial products by way of Labban (2011) and Zizek (2009). I do so by demonstrating why greenhouse gases themselves can never become true commodities in the Marxian sense, because GHGs are not themselves the object of

labor done by regulators in commodity definition. Rather, it is the data representations thereof that are indirectly constructed by way of a complicated metrological regime devised by regulators and their policy interlocutors, which reflect the diverse values in play during their definition. Ultimately, I conclude that cap-and-trade is best understood as a mechanism by which the state can extract rents from polluters, accruing surplus value that polluters might have otherwise used to expand productive, and hence polluting, activities. The extraction of rents, even at modest per ton prices, then allows the state to use surplus value to pursue its climate goals by other means.

Chapter 4 makes a related argument, though takes a dramatically different theoretical tact. While the chapter on commodification works primarily through structural political economy, this chapter on marketization works through ideas in the social studies of finance and performativity theory and how key ideas in neoclassical economics are operationalized or compromised in building a market for greenhouse gas emissions. In this chapter I focus on relationships between individuals, institutions and California's recent economic-environmental history to understand, in Callon's (1998a) terms, the 'laws of the market'. While California has indeed built a platform on which the financial products discussed in the commodification chapter can change hands, the practices by which these exchanges can take place are so dramatically constrained by regulatory rules that it becomes difficult to conceive of them as markets in a traditional sense because these rules prevent the deployment of unrestrained calculative rationality on which markets are predicated (Callon 1998b). This chapter also includes analysis of the concepts

from neoclassical economics that underlie the impetus to marketize greenhouse gases, the actors that are enrolled to make those practices possible, and the controversies that are generative of market rules.

The final substantive chapter deviates significantly in approach from the previous two, engaging with questions about whether markets are the most environmentally just approach to mitigating greenhouse gas emissions. Drawing primarily on comments from before the launch of the cap-and-trade program, I argue that notions of justice, which are inscribed in the bill that authorized the creation of the program in the first place, come to operate within a relatively narrow register. Justice in the regulation became a matter of reducing the cost burden on polluting industries rather than being focused on reducing the impacts of California's polluters on the most marginalized communities. The chapter reflects on the multitude of concerns that the State must take into account in designing environmental regulations and the number of positions that had to be taken into consideration. I conclude that the state is best not to be understood as simply a tool of capital, but a poly-vocal set of institutions that must navigate between these concerns as it conducts environmental policy that appears as economic policy.

Conclusion

To conclude this introduction, let me briefly elaborate what this dissertation *is not*. First, it is not a blueprint by which to build a carbon market. I do not deeply engage with many of the facets of program design, as all of these concerns are simply too sprawling to be contained here. For example, I do not at all delve deeply

into the design, regulation, and operation of California's carbon offsetting program, which is in many ways just as complex as its regulatory compliance counterpart, nor do I closely engage with regulatory actions taken by other state institutions that have some hand in climate regulation in California like the Electricity Commission or the Public Utilities Commission. Further, this dissertation relies on ethnographic methods, but is certainly not an 'E'thnography. While my regulatory participants were overwhelmingly generous with their time, this is not a work of institutional ethnography and I was not embedded with the state nor I am affiliated in any way with them. Finally, the suite of policies implemented in California to come to terms with their polluting landscape is vast- the creation of California's Low Carbon Fuel Standard for refined petroleum products is every bit as involved, convoluted, and controversial as the creation of cap-and-trade, if not more so (Yeh and Sperling 2013). The other major planks of California's climate strategy, like the Renewable Portfolio Standard for cleaner energy generation, have substantial impacts on the polluting geography of California and the overall costs of emissions reductions mandated by the state. I will leave it to others to tease out the ramifications of policy interactions between all of these moving parts.

On a more positive note, this dissertation *is* among the first in-depth explorations of a regulatory environmental commodity from a heterodox economic perspective. I intend it as a sympathetic critique of a program to reduce greenhouse gases in a jurisdiction that has stepped forward to do something about climate change when many others have not. I hope that it will be useful for environmental justice advocates, NGOs that are seeking to strengthen the environmental standards

of the program, and highlight key issues to jurisdictions that are contemplating undertaking the hard work of mitigating their climate impacts. Conceptually, this project represents a step toward a rapprochement between political economy approaches to financialization and performative theories of markets. I have found that a dialog between the two offers a powerful analytical lens through which to interpret the rather strange market (Harvey 2008, Lohmann 2011) that California has built to contain climate externalities. This approach, as seen most distinctly in Chapters 4 and 5, could be applied to any number of financial phenomena, especially environmental commodities like green bonds and ecosystems services that are poised to be the dominant response to our overlapping environmental crises for some time to come. Perhaps by recognizing the dangers posed by these products and understanding the measures required to prevent them, we can envision new types of regulatory strategies that can become the basis of a more equitable, sustainable, socio-natural world.

Chapter 2: The Regulatory Cap-and-Trade Program

Introduction

California's cap-and-trade program is an impressive feat of regulatory engineering. Proponents of markets claim that cap-and-trade programs are less regulatorily burdensome than traditional means of environmental regulation (IETA 2014). The extent that it may be less burdensome for polluters to follow the rules is largely because the burden is displaced onto regulators themselves and their rule-making interlocutors, contractors, and environmental justice organizations. This chapter will discuss all of the moving parts of what is formally known as California Code of Regulations, Title 17, Division 3, Chapter 1, Subchapter 10, Article 5, Sections 95801-96022: California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms to Allow for the Use of Compliance Instruments Issued by Linked Jurisdictions. I will explain the regulation on its own terms by translating the existing regulatory text into a narrative description of all of the actions and actors that have defined roles in making the program functional. I will largely follow the path laid out by the regulatory text with some key deviations for clarity and to point out key sections, the outcomes of which are discussed at-length in the more theoretically substantive chapters that follow.

It is important to note that despite the linearity of the presentation here and in the regulation, the process of developing the regulation was far from being straightforward. At any given time, multiple critical design features of the program were (and still are) under consideration, and program interlocutors had to

simultaneously keep in mind parts other parts of the regulation, both finished and unfinished, in debating each element. In this way, the regulatory process is, rather counter-intuitively, how Harvey (1982) describes Marx's method in *Capital*, wherein it is never possible to see the object of inquiry in its totality, and instead one must shift their perspective amongst a variety of vantage points to see the different ideas and practices that comprise the ontological or programmatic whole.

The current form of the regulation begins with a statement of purpose (95801), which is of great importance for the regimes of value at work in the creation of cap-and-trade (see Chapter 3). The purpose of the regulation,

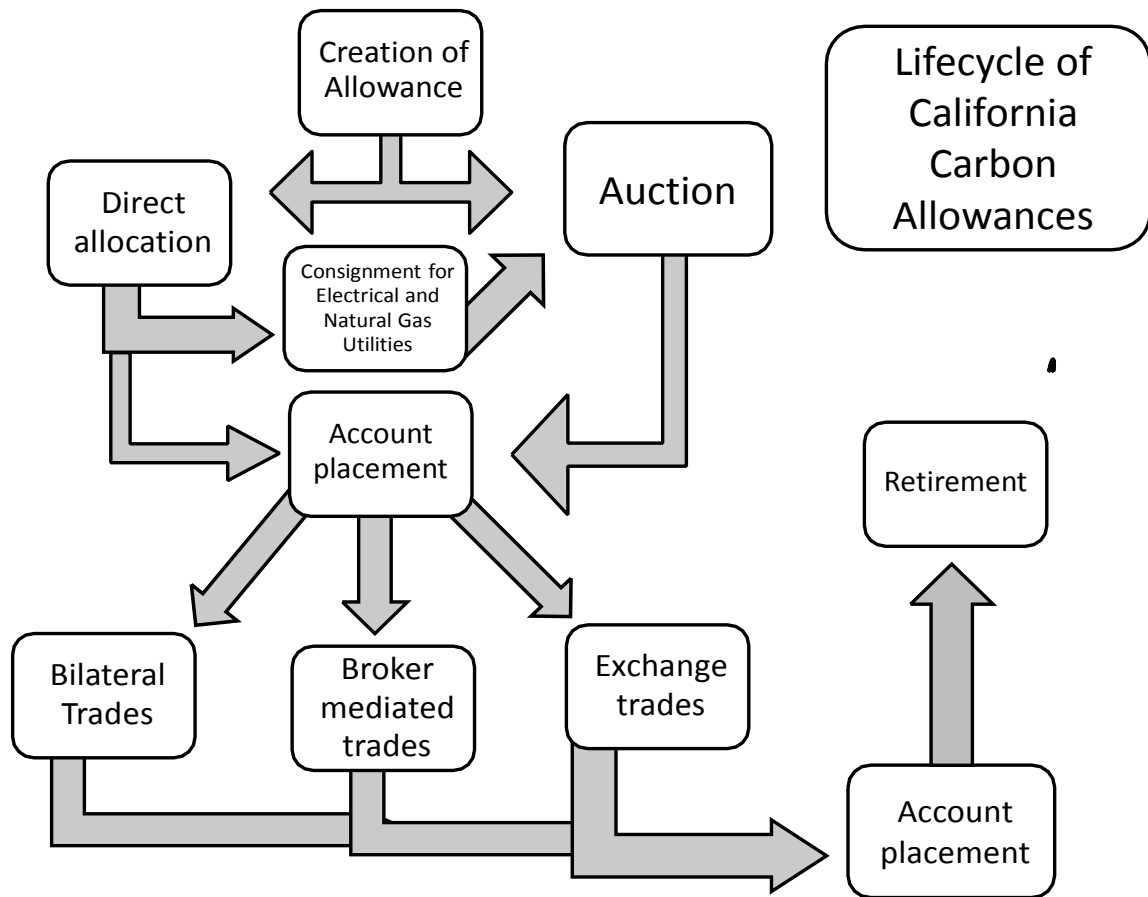
is to reduce emissions of greenhouse gases associated with entities identified in this article through the establishment, administration, and enforcement of the California Greenhouse Gas Cap-and-Trade Program by applying an aggregate greenhouse gas allowance budget on covered entities and providing a trading mechanism for compliance instruments. (p.5)

It bears noting at the outset that the cap is the portion of the regulation that is intended to do the environmental work of emissions reductions, while the trade is a purely economizing add-on, and so from the very outset the environmental and the economic are co-constituted.

The regulation then proceeds with 57 pages of definitions in which 397 terms are specified, along with 42 acronyms. These definitions run the gamut from program-specific nomenclature of the types of financial instruments that are being created by the program, such as "Limited use holding account" (p.34), to physics concepts useful in the definition of the gases under management, like "Radiative forcing" (p.50), to industry and agricultural activity-specific products, like "Pretzel"

(p.45), “Kerosene-type jet fuel” (p.31), and “Facility” (p.24), which has three different definitions that reflect differentiations in the geographic nature of what constitutes a single ‘site’ in the heterogeneous world of polluting production.

The need for all this semantic work becomes clear in the regulations that follow, which describe the primary objects of environmental management for the program. First are the greenhouse gases that the state seeks to reduce emissions of, and second are the entities that conduct activities that emit greenhouse gases. The regulation covers a bundle of greenhouse gases that is comprised of carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulfur hexafluoride (SF₆), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), nitrogen trifluoride (NF₃), and “other fluorinated greenhouse gases,” (p.63). Activities that emit these gases are conducted at facilities engaged in cement manufacturing, glass production, lime manufacturing, and petroleum refining, along with 9 others, as well as the deliverers of electricity, supplier of natural gas, and out-of-state fuel deliverers. This signals a particularly thorny set of issues that will be dealt with at length below; the challenge of quantifying greenhouse gas emissions that are embodied by imported energy products like refined oil, natural gas, and electricity.



Lifecycle of California Carbon Allowances

Program participants

The definition of the entities covered by the regulation also leans heavily on previously established regulations, most significantly the Mandatory Reporting Rule (MRR) that was simultaneously authorized by AB32 that forms the surveillance apparatus by which emissions data is ascertained. That data is used to define the aggregate level of pollution acceptable under the cap (which is effectively the politically determined optimal level of pollution), and the specific contribution to that cap from individual facilities. The following section of the regulation (§95812) defines the emissions thresholds, and the temporal horizons during which those thresholds are crossed, at which individual entities become responsible for

complying with the regulation. In most cases individual facilities become responsible for holding emissions allowances at a threshold of 25,000 tCO_{2e} in a single calendar-operating year in any of the three years preceding the inclusion of their industry in the program. This means that electricity² and manufacturers that had any year of tCO_{2e} emission greater than 25,000 in the years between 2009 and 2012, and transportation fuels suppliers between 2012 and 2014 are subject to mandatory compliance with the regulation. Fuel distribution, including distillates and liquefied petroleum gas, was not brought under the cap until 2015, as discussed above, primarily for political and economic reasons. Entities that breach the 25,000 tCO_{2e} threshold are subsequently obligated to participate in the program for the remainder of the compliance period; the current regulation is structured into three compliance periods; 2012-2014, 2015-2017, and 2018-2020. The distinctions between what occurs different in each of these periods and during each period will be discussed below, as it is critical to understanding the fluid temporality of the financial product the state created in pursuit of least cost emissions reductions.

Polluters who are subject to the MRR but do not cross the threshold of 25,000 tCO_{2e}/year can also 'opt-in' to participate in the program, which entails being "subject to all reporting, verification, enforcement, and compliance obligations" (p.70) of entities that are automatically covered by the regulation. They

² All electricity importers are covered regardless of reported emissions, and those who register the import of power from 'unspecified sources' have a compliance obligation regardless of whether that quantity of unspecified power and its assigned emissions value crosses the 25,000 tCO_{2e} threshold (§95813 (2)(B)2). This becomes useful for understanding strategies by which speculators can subvert certain trading rules as discussed in Chapter 4.

also enjoy the possibility of free allocation of allowances (depending on their industry). Presumably smaller polluters who feel that their (potential) emitting practices are more efficient than either competitors or economy-wide practices could opt-in in the hope that their emissions profile (according to the metrological regime in place to assign compliance obligations and free allocation) could result in net financial gain, in effect extracting rents from other polluters that are less efficient. In the most recent list of covered entities published by the Air Resources Board in late 2013, 459 entities were covered at the 25,000 tCO_{2e} threshold or were or power importers of unspecified power. The disparities between polluters covered by the regulations are yawning.

Complex metrological regimes (discussed below) are required in order to make all tCO_{2e} fungible and to try to create a “level playing-field” (a favorite term in public comments on draft rules) between program participants. On the extreme end of these comparison, as will be discussed in chapter 5, fuel refiners like Tesoro and Chevron each have covered emissions of over 30 million tons of CO_{2e}, while the Ernst and Julio Gallo wine production facility in Fresno has just over the compliance threshold at just over 26,000 tCO_{2e}/year of covered emissions. While each of these facilities emissions occur from dramatically different processes and the co-emission of other pollutants not covered by cap-and-trade from those processes varies widely, each ton of CO_{2e} must be considered equal in the eyes of the reporting and compliance rules.

The third class of program participants are called voluntarily associated entities (VAEs). VAEs are not required to participate in the program, nor are they opt-in participants that are already reporting emissions under the MRR. VAEs, then, are primarily offsets project operators, speculators, or financial intermediaries that may take ownership of allowances on behalf of covered or opt-in entities. This final class of financial intermediaries must be registered with the Commodity Futures Trading Commission as a derivatives clearing organization, and all VAEs are required to have a primary residence in the US. This section, 95814, is the first place in the regulation where a concern with trading malfeasance is manifest. The regulation requires notarized authorization for an individual to participate as a VAE from any covered or opt-in entity that the individual is consulting for, and measures must be in place that the consultant could not use information gained through their consultancy for financial benefit through trading of compliance instruments as a VAE. Additionally, all employees of any entity subject to the MRR or cap-and-trade are ineligible to become VAEs. Further, offset verifiers, offset registries, cap-and-trade program accredited emissions verifiers, and MRR verifiers are all also forbidden from creating accounts from which to trade allowances. It is to the composition of those allowances that the regulation now turns.

Compliance instruments

In California, as in most cap-and-trade programs, there are two broad classes of compliance instruments, or financial representations of emissions permits. The first of is allowances, the second offsets. While both can be used to compensate for an entity's emissions, the genesis of these two classes of instrument is dramatically

different. Allowances are permits that are generated by executive fiat, which are subsequently distributed to polluters via free allocation or auctioning, as will be discussed in detail below. Each individual allowance is assigned a unique serial number that denotes its vintage, or the year's compliance budget from which the allowance originates (95829(a)(2)). Compliance-grade offsets credits are similarly issued solely through the regulator, but are predicated on a complex chain of events that entails a material intervention into the natural environment that sequesters, destroys, or prevents the future emission of greenhouse gases through one of five approved offsets methodologies.

Once issued, both offsets and allowances,

represent a limited authorization to emit up to one metric ton of CO_{2e} of any greenhouse gas specified [by the regulation] subject to all applicable limitations... No provision in this article may be construed to limit the authority of the Executive Officer to terminate or limit such authorization to emit, (p.73).

In effect, these provisions ensure that the ARB is able to redefine the composition or relation between the gases that are under regulation, expand or contract the cap, or generally tweak the use-value of compliance instruments, as discussed in chapter 3. The regulation then goes on to state that holding compliance instruments does not constitute a full property right, which is necessary to solidify the permit-ness of the instruments and legally separate them from the world of purely speculative instruments or real property, as the required surrender might otherwise constitute an unconstitutional taking.

In order to take control of current or future vintage compliance instruments, covered entities, opt-in entities, and VAEs must register with the ARB and set up a number of accounts in which compliance instruments can be held and accounted for. The development and administration of the accounting system, called the Compliance Instrument Tracking System service (CITSS) was contracted out to SRA International whose primary business is in defense industry logistics. The contract was written with Western Climate Initiative, rather than with the state of California, as is the case for most other logistical and financial services functions required to operate the program. This contractual situation makes it easier for other jurisdictions that have, or potentially will develop, a cap and trade program to harmonize accounting within a single system in the absence of a federal or continent-wide market. This potentially avoid the pitfalls of having multiple jurisdictional registries as was the case in the first eight years of the European Union Emissions Trading System, wherein double accounting of allowances made possible billions of euros worth of fraud (Kill et al 2010). According to ARB, the function of CITSS is five-fold. First, it registers participants in the cap-and-trade program; second, it tracks holders of specific compliance instruments; third it enables and records transfers; fourth it facilitates compliance with the program; and finally it “support[s] market oversight” by allowing regulators real-time access to the overarching compliance instrument ownership landscape and specific holdings (ARB 2015).

All compliance entities must, in effect, register for a CITSS account. They may do so either as individual entities, or if multiple facilities are in a “corporate

association”, they may form a consolidated account to combine their holdings. This can be useful for owners of multiple facilities in order to expand the limits on the number of allowances they can own at any given time, as discussed below. The reporting of corporate associations, either direct or indirect, is stringent in order for ARB to be able to piece together the channels through which compliance instruments are trading and monitor the market for malfeasance; CITSS account holders must disclose all direct and indirect corporate associations with any entities that “trade, sell, or purchase for resale any natural gas, oil, electricity, or [GHG] instrument, or natural gas, oil, electric or greenhouse gas emission instrument derivative or swap on exchanges” (p.76). This is actually a relaxation of previous disclosure rules that called for the reporting of all direct and indirect corporate associations, which compliance entities argued was far too burdensome for large corporate entities that might have dozens or hundreds of indirect associations, many of them unrelated to energy products that trade on financial markets.

In addition to corporate associations, would-be account holders must also disclose the names and contact information of all employees and consultants/advisors that have knowledge of an the applicant’s market position or unreleased emissions data or projections thereof (§95830(c)(1)(I)-(J)). Each registered entity must designate a primary account representative, in effect the ARB’s contact person at a given entity and at least one and up to four alternates. VAEs may forego the alternate requirement, but if their primary residence is not in California they have to designate “an agent for service of process” in California, either a person or registered California corporation. Every individual who will have

access to an entity's CITSS account must register as a user in the system and are subject to the program's "Know your customer" requirements, which require a fairly detailed level of disclosure. These requirements will be discussed in the context of their relevant regulatory section below. The regulation assures entities submitting this information that all will be held confidentially except in the course of oversight, investigation, enforcement and prosecution in the event of malfeasance. Rules for registration are explicitly geographical as well. The section includes provisions indicated that entities in linked ETS jurisdictions (at this point, only Quebec) must register for a CITSS account through the terrestrial location of emissions (p.81).

While the language in the regulation up to here is technical it is reasonably straightforward. However, at this point the regulation begins to specify the different account types on offer within CITSS. The differentiation and restriction of the different account types was a major point of contention in rule-making exercises that I was present for in 2013-2014. There are five types of accounts possible in CITSS, and each registered entity may have no more than one of each. The categories are holding accounts, limited use holding accounts, compliance accounts, annual allocation holdings accounts, and exchange clearing holding accounts. The use of each of these will be explained in turn.

Holding accounts are the most vanilla. All CITSS registrants receive one regardless of their compliance status and it is the account in which compliance instruments are most liquid, meaning they can be moved freely into other entity's holding accounts through the normal transfer process. It is not completely liquid,

however, in that all trades still must be approved by the ARB. The second kind of holding account is more specialized and for limited use, and assigned only to entities that receive free (technically 'direct') allocation of allowances. Allowances that are placed in this account by the regulator cannot be move to any other accounts but the auction holding account, and entities may not transfer compliance instruments into the account themselves. The third class of accounts, the compliance account, is effectively a one-way deposit system by which entities designate which compliance instruments they hold will be surrendered to the state to account for their emissions. Allowances can be transferred into this account at any time, but never out. Further, entities must be cognizant of the mix of compliance instruments they transfer to this account because of rules around the order of surrender; provisions later in the regulation stipulate that offset instruments in compliance accounts will be surrendered first, followed by allowances. This means that if an entity transfers more offset credits than their quantitative usage limit allows for surrender into this account, the credits will still be retired but will not count against the entity's compliance obligation and effectively will amount to a voluntary retirement of those credits. This quirk in the regulation will be detailed below.

The fourth class of accounts created within CITSS is the exchange clearing holding account, available only to VAEs. These accounts are specialized for derivatives traders, financial intermediaries that perform financial services, and especially operators of exchanges on which allowances are traded. It works as a liminal space for the transfer of allowances between financial service providers and buyers of compliance instruments, as the allowances that are subject to trade reside

in this account only until the transaction clears and the instruments are transferred into the recipient's designated account. The final type of account is similar to the limited-use holding account, where directly allocated allowances that are not deposited into limited-usage holding accounts are deposited here. The freely allocated allowances can only be transferred into the compliance account of the holder, not into any other type of account.

In addition to these account types that market participants can have, the state also creates a number of accounts to manage the distribution of allowances by way of direct allocation and auction. The first is effectively the genesis point of allowances, known as the Allocation Holding Account, where the serial numbers that represent tCO_{2e} are placed after they are generated. These newly minted allowances reside there until they are moved into Auction Holding Account, which contains not only allowances from the Allocation Holding Account, but also from holding accounts of entities that are consigning allowances they hold for the auction (more on that below) and allowances from the compliance accounts of entities fulfilling an "untimely surrender obligation," which is the fine, denominated in allowances, that entities must surrender if they fail to comply with the regulation. The ARB also operates a Retirement Account, into which compliance instruments are transferred following compliance events. Allowances are transferred out of entities' CITSS compliance accounts to compensate for their emissions and into the Retirement Account. Entities may also voluntarily retire instruments by transferring them into this account.

Finally, there are three other specialized accounts created and administered by the state for holding allowances that could potentially be disbursed through the Allowance Price Containment Reserve (APCR), a pool of allowances held apart from the normal auction process that can be sold at fixed prices in the event that auctions are fully subscribed and clear at prices over that proscribed by APCR usage rules (over \$40/ton to start). The second of these is a Forest Buffer Account where a proportion of offset credits generated through forest sequestration projects are placed to account for the level of uncertainty present in biological sequestration and the possibility of unintentional sequestration reversal, through events like forest fires. Finally, there is a voluntary renewable electricity account, where compliance instruments generated through emissions reductions by way of power-switching above-and-beyond that required by other AB32 measures accrue through the transfer of Renewable Energy Credits. This section of the regulation ends by noting that the Executive Officer of ARB is authorized to create more types of accounts if deemed necessary to implement the program.

As noted above, the designation of account representatives for entities with various types of accounts is a data intensive process. One key component of this section is the exact text of the attestation that all account representatives, both primary and alternative, must submit, pledging full compliance with the regulation and fulfillment of requirements to serve as account representative under penalty of perjury. All account representatives must submit their name, email address, phone numbers and addresses of both workplace and residence, as well as a signed attestation by their supervisor verifying their selection to administer the entity's

accounts. A provision is also included that absolves the accounts administrator (SRA International) from needing to evaluate the documents submitted by participating entities- this responsibility falls squarely on the state. The rest of the section primarily deals with the unseverability of the primary account representative's actions (or inactions) and the corporate entity they represent, which is to say that liability for non-compliance is attributed to the entity, rather than its representative except where the account representative contravenes the provisions in their various attestations. One interesting provision is that the state absolves itself of interest in disputes between two private parties, effectively leaving the resolution of torts that arise in the conduct of transfers between entities up to mediation or judicial review rather than being settled by the issuer of the instruments.

The determination of corporate associations is a key part of deciding what a given entity's compliance obligation, holding limit, and allocation will be. Corporate associations are determined through explicit business linkages; a simple corporate association exists if a greater than 20% ownership stake is held by one entity over another, if they share, or have the ability to appoint, more than 20% of the directors of the other company, and several other property relationships. Direct corporate relationships are stronger bonds, determined by a greater than 50% holding of any class of shares or the right to acquire such a proportion, has greater than 50% of the same directors, hold better than 50% of the voting authority of the other entity, or other majority ownership or directorship arrangements for other company types. All corporate associations of these kinds are subject to reporting to ARB, and entities that have compliance obligations found to have direct corporate

associations have their accounts consolidated in a single set of accounts; entities can choose to opt-out of this consolidation, but there are several regulatory firewalls that then must be navigated through paperwork to ensure the sharing of information between entities with a corporate association is not being done in order to prevent coordinated market action that could have adverse consequences for the program as a whole or is of benefit to one or more of those entities.

Another hurdle entities must navigate in the creation and operation of these accounts are the program's "know-your-customer" requirements that are part of the state's wide surveillance and enforcement powers. In order to gain access to the CITSS system, individuals cannot have been convicted of a felony in the last five years. They must submit documentation of place of residence, date of birth, their employer's name and address, driver's license number, an open bank account, relationship (if other than employment) to an entity already registered in the cap-and-trade program, and any documentation of criminal convictions in the last five years that constitutes a felony. All this information must be notarized and verified by the ARB before any individual can gain access to CITSS to manage their employer's GHG allowances or trade speculatively in compliance instruments themselves. This level of oversight was decried as constituting an unjustified burden during rule-making, particularly given that at major polluters there are often internal reorganizations that would see different people working on managing compliance with cap-and-trade at any given time, and so to be constantly managing the paperwork for these types of entities' CITSS rosters would constitute an undue regulatory burden. However, the rule has remained in place despite these

objections, making not only facilities and allowances objects of the regulation, but the people who perform both as well.

Allowance budgets

Subarticle six of the regulation discusses the regulatory part of the cap in cap-and-trade. The budget for allowances to be distributed by direct allocation, auction in either the normal auctions, from the APCR, and from the voluntary renewable energy account are defined from data drawn from MRR reporting. The program, as a whole, is divided into three compliance periods: 2013-2014, 2015-2017, and 2018-2020. There are internal rhythms to the compliance periods that stagger when compliance instruments must be surrendered, when allowances are disbursed, and when 'true-up', or the process for determining if over or under allocation occurred, happens within each period. In the first compliance period, the allowance budget started at 162.8 million allowances before declining about 2% to 159.7 million allowances in 2014. The second compliance period, which sees the distribution of transportation fuels and other petroleum distillates brought under the cap sees a dramatic rise in the total number of allowances created and distributed, starting at 394.5 million allowances in 2015, then declining 3% per year through the end of the compliance period on December 31, 2017. The third compliance period has a similarly proportional step down, and at the program's current conclusion in 2020, allowances are set to come in at 334.2 million allowances, in sum a 15% decrease over the second and third compliance periods. Allowances may be drawn out of these aggregate totals by way of voluntary renewable electricity generation from sources built after 2005 through a series of

reporting and verification steps from participation in California's renewable portfolio standard and renewable energy credits markets. The number of allowances retired is subject to the rather simple (comparatively) formula of $MT_{CO_2e} = MWh \times EF$, where allowances are interchangeable with MT_{CO_2e} , MWh is megawatt hours, and EF is the CO_2e emissions factor for an unspecified source (which is $0.428 \text{ mt}_{CO_2e}/\text{mwh}$, which is between the calculated emissions factors of natural gas (0.4) and coal-fired (1.0) power generation) (US EPA 2014). ARB then cross references those calculations with documentation of actual sales and transmission of power and sales of renewable energy credits to retire allowances out of the Voluntary Renewable Electricity Reserve Account, such that those allowances never actually enter circulation.

Compliance requirements

Subarticle seven defines how compliance obligations are determined by using emissions data during each compliance period. It reiterates mandatory compliance with the MRR, which is, after all, the surveillance mechanism through which polluters are regulated. Every facility subject to the regulation is assigned a compliance obligation for every metric ton of CO_2e for which a positive or qualified positive emissions data verification statement is issued, or for emissions assigned on the basis on the MRR. Every facility is mandated to maintain their emissions data records for ten years and the ways that used that data to determine their compliance obligation.

The subsequent section lays out explicitly when specific entities are brought into the program. In compliance period one, CO₂ suppliers, generators and first-delivers of electricity that meet the 25,000 tCO_{2e} threshold are included. While supplies of natural gas, liquid petroleum and natural gas, and other fuel oils have compliance obligations beginning in the second compliance period, while cogeneration (combined heat-and-power) that have been exempted by the ARB are exempt and the compliance obligation by these energy producers reverts to the upstream provider of natural gas. The only industry that has a compliance obligation that begins in the middle of a compliance period is waste-to-energy facilities, which arrive under the cap in 2016.

Having dealt with the timing of industries' inclusion under the cap, the regulation turns to define the emissions categories for which each industry is responsible for holding allowances. Facility operators have a compliance obligation for all verified qualifying emissions or the aggregate emissions attributed to them through the MRR in the absence of positive or qualified positive verification statements. The process of facility demarcation described above spatially delimits compliance obligations. A significant shift in compliance obligations occurs in 2015, when emissions from the combustion of transportation fuels are removed from facility operator's emissions tab when those fuels revert to their distributor's compliance obligation so as to prevent double counting of those embodied emissions.

At this point the complexity of the metrological regime, the system of measures designed to assign definite quantitative values to a particular phenomenon, in this case of compliance obligations, becomes an issue. Logically, this section begins with electricity first-delivers (if importers and the state from which the power is imported is not linked to California’s cap-and-trade program) or electric power facilities located within the state. All emissions are covered except for those specifically exempted further down in the section. A typical formula for determining a compliance obligation for a power importer looks like this:

$$CO_2e_{covered} = CO_2e_{unspecified} + (CO_2e_{specified} - CO_2e_{specified-not\ covered}) - CO_2e_{RPS_adjustment} - CO_2e_{QE_adjustment} - CO_2e_{linked}$$

Where:

CO₂e covered = Annual metric tons of CO₂e with a compliance obligation.

CO₂e unspecified = Annual metric tons of CO₂e from unspecified imported electricity calculated pursuant to MRR 95111(b)(1).

CO₂e specified = Annual metric tons of CO₂e from imported electricity from specified sources that meet the requirements of MRR section 95111(b)(1).

CO₂e specified-not covered = Annual metric tons of CO₂e without a compliance obligation pursuant to section 95852.2. from specified sources that meet the requirements in MRR section 95111(b)(1).

CO₂e RPS_adjustment = Annual metric tons of CO₂e calculated pursuant to MRR that meets the requirements of section 95852(b)(4).

CO₂e QE_adjustment = Annual metric tons of CO₂e from qualified exports pursuant to MRR section 95111 that meet the requirements of section 95852(b)(5).

CO₂e linked = Annual metric tons of CO₂e from electricity with a first point of receipt located in a jurisdiction where a GHG emissions trading system has been approved for linkage by the Board pursuant to subarticle 12. (p. 107-108)

What this means, in effect, is that a power importer’s compliance obligation is determined by the quantity of power they have imported from unspecified sources that is ascribed the default emissions rate defined by the MMR plus the

amount of power imported from specified sources that have a specific emissions factor assigned to it based on the fuel source minus emissions that may be embodied in that power but are exempt from the regulation, like biomass emissions. The compliance obligation is then reduced by the sum of the emissions that fall outside of cap-and-trade's purview because they are covered by the renewable portfolio standard, minus the quantity of emissions embodied in power that were exported to states that are carbon unconstrained, minus power that was exported to jurisdictions that have a linked cap-and-trade program, where those power emissions could be accounted for.

A key provision in this section is the limited prohibition of resource shuffling, a concept that will be explored in some detail, along with its' ramifications in both Chapters 4 and 5. While resource shuffling, or 'paper reductions' of emissions by power importers by way of reporting changes or contract changes that are not motivated by economic concerns exogenous to cap-and-trade compliance is prohibited, thirteen 'safe harbor' provisions were introduced into the regulation at the urging of industry and the Federal Electricity Regulatory Commission. Cullenward and Weiskopf (2013) demonstrate that these safe harbor provisions have already resulted in a number of dubious contracts, an assertion ARB has vigorously denied (Nichols, public hearing, April 2014). Despite all of the loopholes built into the regulation, it maintains text forbidding the substitution of relatively low emissions power for power generated at a more polluting plant through contractual means that does nothing to lower aggregate emissions, or reworking contracts to include a third party to which the high emissions electricity is assigned,

thereby reducing the importers' compliance obligation. The regulation goes on to discuss in more detail the ways in which power can become specified, thus earning a potentially lower emissions factor than that of unspecified power, including all the documentation necessary to qualify for renewable portfolio standard adjustments, qualified export adjustments, and the process of verifying data through the mandatory reporting rule, particularly verification that any renewable energy credits earned as part of power generation through renewables are verified to have been retired so as to prevent double-usage of these value-bearing credits.

The regulation then defines how compliance obligations are attributed to suppliers of natural gas, stating that they have a compliance obligation for,

every metric ton of CO₂e of GHG emissions that would result from the full combustion or oxidation of all fuel delivered to end users in California that is contained in an emissions data report that has received a positive... data verification statement or for which emissions have been assigned (112-113).

From that sum, emissions embodied in natural gas that is delivered to other facilities that have compliance obligations is subtracted based on cross-referenced data from the natural gas supplier and the receiving facility. Compliance obligations are then defined for fuel suppliers, liquid petroleum gas suppliers, suppliers of blended fuels, CO₂ suppliers, and petroleum and natural gas systems (pipelines), in turn. The key idea is that each facility type is responsible for all the emissions (less specific exemptions for some) embodied in the energy products they supply to end-user or lower-order distributors. When combined with the compliance thresholds, these definitions serve to keep the number of participating facilities as low as possible since the object of management is the point of production and/or import,

rather than the attempt to regulate the consumption thereof- according to the economic theory, consumers will respond to the price signal that distributors build in to compensate for the emissions compliance instruments they must purchase. It is worth noting once again that each of these compliance obligations is generated not from regulating the products themselves, but from the data representations thereof as denoted by positive emissions data reports filed under the MRR. The compliance obligation of all the facilities discussed above is the sum of emissions of CO₂, CH₄, and N₂O resulting from the combustion of fuel, emissions of CH₂ and N₂O that were emitted from the combustion of bio-mass derived fuels, vented CO₂, CH₄, and N₂O emissions (with significant exceptions) and CO₂ emissions from both exempt and non-exempt biofuels (115).

The regulation then goes into some detail about the calculation of compliance obligations for the challenging metrological case of combined heat and power stations, as well as to list the types of biomass combustion that do and do not engender a compliance obligation. In effect, biomass combustion emissions become exempt if the biomass is sourced from reported solid waste, pallets and manufacturing wood waste, agricultural crops or waste, wood and wood waste that was harvested as part of an approved timber management plan or harvested as part of forest fire reduction strategies; biodiesel, fuel ethanol from cellulosic, corn starch, or sugar cane feedstocks; the biogenic part of municipal solid waste; biomethane and biogas from plant, animal, and organic waste or from landfills and wastewater treatment; or renewable diesel. The purpose of exempting all of these biologically derived fuels is to incentivize their use as they are conceived of as renewable.

Additional exemptions from non-biological emissions sources include emission from geothermal power or natural gas hydrogen fuel cells; vented and fugitive emissions from storage tanks used in petroleum and natural gas storage (these facilities are part of a separate rulemaking that aims to reduce storage emissions), and a number of other very specific industrial exemptions, notably emissions from offshore petroleum production, vented emissions from small centrifugal and reciprocating compressor oil wells, and all carbon dioxide that is exported for any use other than enhanced oil recovery or geologic sequestration (123-124).

The regulation then moves to define the mechanics by which an entire compliance period's obligations are calculated. It reiterates that any facility that breaches the compliance threshold in any of the four years before a compliance period becomes a compliance entity for the entire compliance period. Their obligation is equal to what has been calculated by way of the metrological regime defined above through the MRR. Entities that cross the compliance threshold in the first year of a compliance period are then automatically included for the rest of the compliance period, while those that become covered entities in either the second year of the first compliance period (which is only two years long) or the final year of subsequent compliance periods are subject to a different schedule wherein their full compliance obligation will not be due until the end of the next compliance period. The next section defines the limitations on what kinds of compliance instruments can be used to fulfill compliance requirements, and when they can be used. This is the section that defines the state's quantitative limit on the usage of offset for compliance obligations, which is set at 8% of total emissions. See Chapter 5 for a

discussion about what this means for aggregate pollution reductions created by the program. Covered entities are required to annually submit their compliance instruments corresponding to 30% of their total compliance obligation. The compliance instruments that are surrendered cannot be denominated in future vintages, that is, there is no 'borrowing' allowed from future compliance budgets to fulfill current obligations. This restriction is necessary because allowance auctions run simultaneously for different vintage allowances, as discussed below in the section on auction methodology. Conversely, this means that allowances can be banked for future compliance use.

The actual mechanics for compliance instrument surrender are rather involved. As mentioned above, covered entities must move the instruments they mean to surrender for a compliance obligation from whatever account in which they are currently in to their compliance account (so long as that allowances from that account are allowed to move to the compliance account). Covered entities must complete this action before November 1 of the year after the emissions they are compensating for took place. There is no annual compliance event in the years following the end of compliance periods; instead, these are triennial compliance events at which all of the final year's emissions, plus whatever emissions from the previous years that are unaccounted for remain. In practice, this would mean that for the second compliance period, a covered entity could submit 30% of its emissions obligations from 2015 on November 1, 2016, 30% of its emissions obligations from 2016 on November 1, 2017, and then 100% of its emissions obligations from 2017, plus 70% of its emissions obligations from both 2015 and

2016 on November 1, 2018. Assuming emissions are static, this means that, at the maximum, a compliance entity could submit 80% of its required compliance instruments every three years. This has interesting ramifications for market function, in that unprepared buyers could find themselves hostage to high prices engendered by high demand and low supply immediate prior to the triennial compliance event. It bears noting that Quebec compliance instruments are fully fungible with California's, so those may be included in the bundle of allowances and offsets an entity may turn over for compliance. After these instruments are submitted to the state for compliance, they are then retired and a record of used serial numbers kept.

In a rather interesting regulatory maneuver, ARB included a provision that enumerates the order in which different types of compliance instruments are retired from the compliance accounts of covered and opt-in entities. First, offset credits are used to compensate for up to 8% of an entity's compliance obligation, per the quantitative usage limit. Then allowances purchased from the APCR, which are not vintage-denominated, followed by allowances procured either through direct allocation or auction purchase, starting with older vintages first, and finally current calendar year-vintage allowances. The triennial surrender event follows the same order. If an entity fails to meet the compliance deadline, they are subject to administrative action. The only way they can avoid being penalized is if their reason for failing to surrender the appropriate number of allowances is if that entity had previously held enough compliance instruments to satisfy their obligation, only to have offset credits deemed invalid by ARB within six months before the surrender

event. The peculiarities of offset invalidation will be touched on below. In the event that an entity does not comply with their surrender obligation, they are effectively charged a fee of four compliance instruments for every one they were short, and three quarters of those penalty compliance instruments must be allowances rather than offsets, and offsets may still not comprise more than 8% of the total number of allowances submitted. This 'untimely surrender obligation' is due within five days after the first sale of auction the state conducts following the assessment of the penalty, and in this case future vintage allowances can be used for compliance. If the offending entity fails to comply with its penalty obligation in full, the outstanding amount is once again subject to the 4:1 untimely surrender obligation. These penalty allowances are not retired, rather three quarters of the allowances (not offset credits) are transferred into the offender's Auction Holding Account, where they will be resold at the next auction, while the remaining quarter (the originally uncompensated-for emissions) are retired, thus maintaining the aggregate supply-demand balance of the market.

Penalties also apply for underreporting emissions data and, by extension, under-surrendering compliance instruments. While this type of punitive action has not been taken yet (nor the standard non-compliance above), several of the largest polluters in the state, including PG&E, the Bay Area utility, have already run afoul of the MRR by failing to submit emissions data in a timely manner. If the discrepancy is less than 5%, no action is required. However, if the discrepancy is larger than 5%, then the offending entity is required within six months to submit a quantity of allowances (not offsets), then a formula is used to make up the difference where the

correct emissions data minus the entity's compliance obligation from a previous compliance period from which that same number is multiplied by 0.05 is subtracted. So, for example, if a compliance entity were found to have emitted 90000 tCO_{2e} but failed to report it as such, and had previous emissions reported at 100,000 tCO_{2e}, it would have a compensatory surrender of 5500 allowances. Entities subject to this action have six months to comply and may use future denominated vintage allowances to compensate. These actions can be used through the life of the program, as the executive officer is given 8 years of backward looking authority to impose sanctions on underreported, under-surrendered emissions. One final thing to note on these types of sanctions is an interesting epistemic division, wherein allowances and the underlying emissions data are explicitly kept separate. For example, "If the difference between the emissions used to calculate the compliance obligation and subsequently calculate the number of compliance instruments surrendered..." (135). In this case it is clear that the emissions, the data reports thereof, and the allowances that come to stand in for them are all held as ontologically distinct units, which will be of interest when considering the commodity form in Chapter 3.

Disposition of allowances

Subarticle eight details the outcome of the most contentious topic in program design, how to distribute allowances to compliance entities. It remains 'hot' (c.f. Callon 1998a), in that it is constantly under revision, and those revisions have generally resulted in greater levels of free allocation to polluters in the name of fairness and mitigating the possibility of leakage, or a situation in which regulated

entities leave the state to avoid participating in the program, taking their pollution, tax money, and jobs with them (discussed in-depth below). The subarticle begins with the procedures by which the state populates its sundry accounts with different types of allowances. For the Allowance Price Containment Reserve, the pool of allowances to be held back from auction in case of high prices, the regulation calls for 1% of total allowances to be held back from the total emissions budget in the first compliance period, 4% from the second, and 7% from the third. These allowances are only to be sold if the price in the normal auction process exceeds key thresholds, and are sold at a separate auction from the regular quarterly allowance sale that requires prior registration on the part of purchasers. In addition to the allowances moved to the APCR account, the state moves 10% of all available emissions allowances from all years during the second (2015-2017) and third (2018-2020) compliance periods into its Auction Holding Account, from where these future-denominated compliance instruments can be sold. When they are sold according to the auction schedule, the revenue is handled by the state's financial services administrator, Deutsche Bank, and the proceeds are placed into the Greenhouse Gas Reduction Fund that is ultimately controlled by the California Legislature, who determine where that money is appropriated. In addition to these two mechanisms of distributing allowances within the state's account there is a further specialized account for Voluntary Renewable Electricity where the regulator deposits 0.5% of total allowances for the first compliance period, and 0.25% of total allowances from each year of the second and third compliance periods. These

allowances can then be freely distributed to entities in the electricity sector based on the submission of evidence described above.

The regulation then moves to the distribution of allowances to specific sectors, which effectively amount to their free allocation budget. Electricity related allocation comes first. Electrical distribution utilities are allocated 97.7 million metric tons as a baseline that is then multiplied by a 'cap adjustment factor' that declines year-over-year by slightly less than 2% per annum. This means that electrical distribution utilities received 97.7 million allowances for free (though with significant complications, see below for the consignment arrangement for electric utilities) in 2012 (for 2013 compliance); in 2016 the number of allowances will be 90.37 million allowance, and in 2020 83.13 million allowances. This sums to a reduction in free allocation of about 15% over the life of the program, commensurate to the cap decline. Direct allocation to industrial emitters occurs in a similar fashion overall, but with differences in the proportional number of free allocation between industries. There are multiple factors in play in determining free allocation to industrial polluters.

The most contentious of these was the creation of a categorization scheme for determining 'leakage risk', or the likelihood of relocation to avoid regulation, or closure of a facility due to unconstrained competition. Industries, organized by NAICS code, are sorted into high, medium, and low leakage risk classifications. While differences between the three were formerly must more pronounced, free allocation has been dialed up across all leakage classification from earlier drafts. The industry assistance factor (the number by which industry-specific allocations are multiplied

by to arrive at the actual number of allocations freely distributed) is 100% for the first and second compliance periods for all entities under the cap. Industries that fall into the high leakage risk category include some of California's most powerful and lucrative industries, including fossil fuel extraction activities, forest products like paper and paperboard, and some mining activities, along with industries that are seriously trade-exposed (subject to external competition) but critical to the California economy, like cement and glass manufacturing that are closely tethered to the construction industry. Medium leakage risk includes the largest diversity of industries including most of California's agricultural production and processing activities, ranging from poultry processing, dairy products, and canning of fruits and vegetables, to breweries and wineries. Other industries at medium leakage risk include the huge emissions of petroleum refineries and most of the industrial activities that were not considered high risk, like sheet steel and aluminum and industrial gas manufacturing. Industries considered to be of medium leakage risk received a 100% assistance factor for the first and second compliance period, but then see their allocation bumped down to 75% in the third period. Low leakage risk is the smallest of the categories, populated by just five NAICS codes, including the pharmaceutical industry, what is left of California's once vast defense industry in terms of finished military hardware, and support activities for air transportation. Low risk industries also received 100% industrial assistance factors in the first and second compliance period, while only receiving 50% in the final compliance period. These assistance factors do not mean that all industries receive 100% free allocation

until 2018, but that it is a further fraction of the proportion of free allocations they are granted later in the regulation.

The regulation then goes on to note that free allocations cannot exceed the total number of allowances available in a given year, and if the calculated totals exceed the entirety of the emissions budget then each entity will be given a prorated number of allowances to stay at the budget. From here, the regulation gets into specific situations in which free allocations are adjusted, each largely arising from unique cases or pre-existing contracts that had to be worked out between industrial interlocutors and regulators, particularly the operators of combined heat-and-power facilities, industrial entities that purchase this thermal output, steam provided to public educational facilities, and power generators that have long-standing (legacy) contracts with or without industrial counterparties that are eligible for free allocation.

Most of these situations result in the increase of the number of free allocations for relevant parties, but are not distributed preemptively as is the case for other industrial disbursements; instead, they take place post-facto through a process of true-up based on reported and verified emissions data. The same subarticle that includes the methodology for direct allocation also specifies how the proceeds from the auctions of allowances not directly allocation by way of the above methodology are to be spent, simply noting that spending is the legislature's prerogative within significant constraints, as discussed in Chapter 3.

The following subarticle continues to define the process by which industrial assistance takes place. The subarticle begins by noting, in effect, that each industrial

compliance or opt-in entity must be up to date on their GHG reporting activities in order to receive industrial assistance. It is here that the methodology for free allocation and the quantification of emissions becomes intensely technical and different quantification methods must become commensurate because of the vast breadth of the industries California chose to cover in its cap. The product-based allowance determination works as follows. The number of allowances assigned in a given year for facilities with a product-based output allocation is equal to the output of the facility two years previous to the allocation in question based on the number of eligible activities that take place at the facility, multiplied by the emissions efficiency benchmark per unit of output (discussed below), multiplied by the assistance factor assigned based on leakage risk, multiplied by the cap decline factor (the ~2% per annum decrease discussed above). To this sum a true-up allocation can be added, “to account for changes in production or allocation not properly accounted for in prior allocations” (153). The methodology is similar to the initial allocation formula and is designed to quantify the number of allowances a facility should have been given based on actual activities- in effect, to correct for any changes in output and attendant emissions changes.

This allocation methodology applies for covered industries under the cap-and-trade program, include fossil fuel extraction, mining, food processing, paper products, petroleum refineries, other kinds of primary materials and manufacturing including glass, cement, and gypsum. The efficiency benchmark per unit list makes for fascinating reading in terms of the achievement of fungibility between radically different products and the processes used to produce them. All activities listed

result in a benchmark value that denotes allowances per unit of some material output. These values range from 11.9 allowances per metric ton of liquid hydrogen sold and 12 allowances per short ton of dry color concentrate produced by wineries on the high end, down to 0.00113 allowances per proof gallons of distilled spirits. The full range of commensuration is dazzling. Fungible units are assigned for benchmarks ranging from short tons of potato chips (0.824) to short tons of calcium ammonium nitrate solution (0.0902), a fertilizer. Other key emissions benchmarks include allowances per complexity weight barrel, the metric noted above for calculating refinery output; allowances per barrel of natural gas liquids produced (0.0118); and allowances per barrel of oil equivalent produced using thermal enhanced oil recovery (0.0811). Facilities are sorted into these classifications by six-digit NAICS codes.

The second methodology that results in the allocation of fungible emissions allowances is the energy-based method. Allocations for this methodology equal to the number of millions of Btu of steam consumed by a facility less the steam consumed in the production of electricity times the emissions efficiency baseline per unit of steam, defined in the regulation as 0.06244 allowances/million Btu of steam, plus the historical baseline annual arithmetic mean of energy produced through fuel combustion at a facility measured in million Btus. This number is in turn derived from either measured or default heating values of the combusted feedstock based on federal electricity regulations, less the energy used to generate steam already accounted for in the first component of the formula; this number is multiplied by 0.05307 allowances/million Btu, the emissions efficiency benchmark per unit of

energy from fuel combustion. From this sum the amount of electricity sold or otherwise provided for offsite use in MWh, multiplied by the benchmark of 0.431 allowances/MWh. The value of the sum total of these operations is then multiplied by the assistance factors discussed above, then that value multiplied by the cap decline factor. This perhaps necessitates an example. For the compliance year 2019, an aircraft manufacturing facility consumes 1,000 mmBtu of steam and produces 1,000 mmBTus of power by combusting 8,000 short tons of naphtha, which has a high heating value of 0.125 mmBtu/short ton according to federal regulations. This facility then sells 5MWHs of power across the fence to another facility. In 2018, this would result in an allocation of 62.44 allowances for steam, plus 53.07 allowances for power, minus 2.155 allowances for the electricity sold over the fence. This results in a sum of 113.355 allowances. This number is then multiplied by an industrial assistance factor of 0.5, because aircraft manufacturing is considered low leakage risk, resulting in a value of 56.6775. That value, in turn, is multiplied by 0.888, the cap decline factor for 2018, which ultimately results in a free allocation of 50 allowances.

In order to determine the disposition of allowances, the ARB is authorized to use all data gathered from the MRR and can gather further information from other reliable sources. These sources can include data reported by facilities on a voluntary basis for facilities that were party to the California Climate Action Registry (discussed above in the history of California climate policy) from 2000-2007. The rules also stipulate that free allocation based on the energy methodology cannot

exceed 110% of the highest reported emissions during the baseline data years for a facility. The regulation then goes into similarly complex allocation methodologies for special cases, including new entrants into the cap and the trade program depending on whether they have well established emissions data or not, allowances allocated to individual petroleum refineries during the first compliance period, allowances for universities of public service facilities, and adjustments to allocation made for facilities that are designated as legacy contract counterparties.

If this were not complicated enough, the regulation moves on in Section 95892 to consider how allocation to electrical distribution utilities can take place while protecting electricity ratepayers. This was necessitated by the recognition of the sensitivity of the state's electricity supply and the adverse results of free allocation that occurred in the European Union ETS. The regulation specifically states that,

Any allowance allocated to electrical distribution utilities must be used exclusively for the benefit of retail ratepayers of each such electrical distribution utility, consistent with the goals of AB32, and many not be used for the benefits of entities or persons other than such ratepayers (185).

This means that free allocation cannot be used to benefit shareholders at the expense of ratepayers. The machinations necessary to ensure this condition is upheld is a fascinating exercise in market design.

The allocation of allowances to electrical utilities follows two different protocols, one for investor owned utilities (IOUs) and one for Public Owned Utilities (POUs), electric cooperatives, and joint power authorities (JPAs). For IOUs,

allocations are moved from the state's account to the utilities limited use holding account as described above. POU and JPA can elect to have their instruments deposited in some combination between their limited use holding account or have the allowances deposited directly to their compliance account from which they cannot be withdrawn. If a POU/JPA fails to inform the state as to which account they want the allowances deposited in, the state defaults to the limited use holding account, the account from which electric utilities can sell allowances through the state through consignment.

In 2012 (the first year in which an auction took place), one third of the allowances residing in an electrical distribution utility's limited use holding account had to be auctioned. Each subsequent year, utilities have to offer all allowances it holds in that account that are denominated for the current calendar year and any allowances held over from previous years. Any monetary value that utilities receive from the consignment of allowances are subject to ARB restrictions, restrictions set by the governing bodies of POU, as well as any further restrictions imposed by other regulatory bodies, the California Public Utilities Commission in particular for IOUs.

Perhaps to emphasize their seriousness, the regulation then goes on to restate the prohibition on using auction proceeds for anything purpose other than the benefit of ratepayers consistent with the goals of AB32. This prohibition includes using, "such allowances to meet compliance obligations for electricity sold into the California Independent Operator markets" (the state's power grid administrator) (186). The regulator does not just take the word of the utilities that

these prohibitions have been complied with. ARB requires each utility to submit a report by June 30 of each year detailing how auction revenues were spent in the previous calendar year. The report must include the total monetary value of consigned allowances, how the spending of that money complies with the restrictions listed above, and the value of the allowances that were placed directly into utility's compliance accounts. This value is arrived at by multiplying the number of directly deposited allowances by the average auction-clearing price of the previous four auctions. Finally, the utility must report how the monetary value that could have accrued to the utility had those allowances been sold rather than retired was spent, which is a challenging counterfactual exercise. While POUs that have the option of directly depositing allowances into their compliance account likely must be creative about their answer to this challenge, it must be within reason as these reports can be rejected.

The section closes with a table detailing what proportion of each year's budgeted electricity allowances (starting at 97.7 million allowances, declining thereafter) each of the state's 54 electrical distribution utilities receives. These proportions range from the 34% captured in 2013 by Southern California Edison, the giant IOU that serves the Los Angeles area and Pacific Gas and Electric, the Bay Area's primary utility that is publically owned that claims 26% of that 97.7 million allowances, all the way down to the small POU operated by the City of Industry, an industrial enclave 22 miles north of downtown Los Angeles that will only be allocated 0.01% of the total allowances available for electric utilities in 2020.

Individual natural gas suppliers (NGSs) have a similarly convoluted allocation methodology and have similar prohibitions on the way their exchange value can be disposed of. The formula for natural gas suppliers works as follows: The number of allowances in a given year is equal to the emissions calculated for data year 2011 using the formula laid out in the section above multiplied by the cap adjustment factor, the roughly 2% decrease. Like POUs, NGSs may opt to have allowances transferred into limited use holding accounts or directly into their compliance accounts, or some combination of the two. Unlike POUs, there are specific proportional requirements for the number of allowances that must be placed in the limited use holding account. Starting in 2015 when NGSs compliance obligations begin, a quarter of directly allocated allowances must be consigned, with the percentage increasing by five percent a year, culminating with half of directly allocated allowances required for consignment in 2020. If an NGS fails to direct the ARB to distribute allowances in a particular way, the remaining allowances after the mandatory consignment percentage will be deposited into the compliance account, reflecting the state's preference for allowances to be disposed of in this way. As far as the consignment process, NGSs have the same 'monetization requirement' as electrical distribution utilities, wherein all allowances denominated for the current year or any previous years held in the limited use holding account must be offered for auction during one of the state's quarterly auctions. The proceeds from this consignment is subject to the same restrictions as that of electric utilities, with the additional prohibitions that any money returned directly to ratepayers cannot be done in a volumetric manner; that is, refunds cannot be issued to ratepayers based

on how much natural gas they consume, which would directly benefit larger users, contra the aims of the program as a whole. Natural gas suppliers must file the same reports as those of their electricity counterparts regarding the disposition of allowance value, both realized and counterfactual.

Section 95894 covers how allocation is made to electricity or thermal energy providers that are locked into long-term contracts (written before 2007) in which the terms do not allow for renegotiation for the party with the compliance obligation to pass through allowance costs to purchasers. The vast majority of these situations have been resolved over the course of rulemaking, as the Air Resources Board has actively encouraged resolutions. Opt-in entities are not entitled to compensatory relief in these situations, only compliance entities who must participate in cap-and-trade can claim these free allowances and only through a series of attestations that carry perjury penalties in case of falsification.

These attestations include emissions data for the previous year and for 2012 data year (for comparative purposes), data from the legacy contract in question, including the data of commencement and expiration, the “terms governing price per unit of product” (198), and the signature page of the contract. The attestation will further include statements confirming that each contract in question does not allow the generator to recover the cost of emissions embodied in the quantum of product sold, that the contract was executed before September 1, 2006, remains in effect, and that the contract has not been renegotiated in terms of price, quantity of electricity or thermal output, any GHGs specified, or the end date on the contract, and finally a statement that good faith attempts were made to renegotiate the

contract to account for emissions costs. If any of that information changes in the course of a given year in which a party is receiving transition assistance for legacy contracts, they must update the ARB within 30 days.

The regulation goes into how allocation is to be made for entities that meet the relevant criteria, but for brevity's sake I will refer readers to the relevant section of the regulation rather than rehearse formula that are many times more involved than previous allocation methods. They are worth viewing, however, if the reader is interested in the level of complexity engendered in creating a metrological regime that can associate particular polluting activities with individual polluters that are then capable of building a carbon price, whatever it may be, into its business arrangements. The ARB can do so using any available data sources, including soliciting invoices from relevant parties to determine actual amounts of product delivery in determining the appropriate number of allowances to allocate based on legacy contracts.

The next section is another highly specialized allocation methodology, this time for Public Wholesale Water Agencies. In this case, as with electricity and natural gas suppliers, allocation is made to prevent cost pass-throughs to water ratepayers. This case applies to only one compliance entity, the Metropolitan Water District (of Southern California). Interestingly, given the level of complexity and transparency involved in the creation of allocation to legacy contracts, no methodology is directly listed in the regulation; instead, the MWD is directly allocated 182,499 allowances in 2015, declining to 133,065 CCAs in 2015, and concludes with an allocation of 40,723 CCAs in 2020.

Auction and sale of California GHG allowances

Having now accounted for the volume of allowances that are directly distributed to polluters, the regulation considers the mechanics by which the state can sell the remaining allowances. While the politics and outcomes of these decisions are discussed in Chapters 4 and 5, this section will merely provide a description of the process as it occurs. The first auction took place on November 14, 2012, while each of the 8 quarterly auctions for 2013/2014 were to take place on the 12th business day of the second month of each quarter. So, for example, the second auction took place on February 19, 2013. The first eight auctions were conducted by California only, with all subsequent auctions conducted jointly between California and Quebec.

In these auctions, there are two different sales going on simultaneously: the Current Auction and the Advance Auction. The current auction involves the sale of allowances denominated either for the current year or for previous years while the advance auction offers future vintage compliance instruments. Each current auction is to include a quarter of the number of allowances made available for each year in addition to any allowances made available for consignment from electric or natural gas utilities, and may include any allowances that were unsold in previous auctions. Unsold allowances are held back until two consecutive auctions fully clear above the floor price (explained below), and the volume of reintroduced allowances cannot be greater than 25% of the total allowances on offer in a given current or advance auction to prevent flooding the market. Any excess allowances at that point will be held back for future auctions if the above conditions continue to be met (219).

Advance auction potential volumes are designated in a similar way, except that they are auctioned three vintage years in advance. So, for example, the February 19, 2013 auction included one quarter of available vintage 2013 allowances in the current auction and one quarter of the available 2016 allowances in the advance auction.

Each auction is conducted with a price reserve, or floor below which the ARB will not sell allowances. This provision seeks to rectify problems that have occurred in other emissions trading schemes where prices fell well below a level that regulators think will engender behavioral change by polluters. It also, in theory, ensures a floor amount of revenue the state will glean from polluters (See chapter 3 on rent). The price floor is harmonized across California and Quebec using the Bank of Canada's official exchange rate at noon the day of the auction. The floor price started at \$10/ton in the 2012 auction, and then rises five percent plus inflation (calculated with the all urban consumers CPI) annually. The price floor remains the same for a calendar year before being adjusted. Both current and advance auction allowances have this floor price, which, in theory, means that future vintages bought in advance auctions include a significant intertemporal discount which could be arbitrated in future secondary markets if the owner is willing to bear the cost of carrying. This strategy is significantly complicated by holding limits discussed below in Subarticle 11.

The format for the auction is a single round, sealed bid auction that lasts from 10 AM to 1 PM on California time on the designated date. Bid quantities are submitted in lots of 1,000 allowances resulting in dollar amounts that are whole dollars and cents. Each entity is allowed to submit multiple bids. The auction-

clearing price is determined by the lowest bid that is still above the price floor of the last allowance available. Therefore, if an entity bids for 1000 allowances at \$50/ton and a further 1000 allowances at \$45/ton, but the auction-clearing price is \$12.10, all entities, including the high bidder, are obligated to buy the number of allowances they bid for above the clearing price at that clearing price (in this example, \$12.10). Bids can be rejected if they violate purchase limits (discussed below), if acceptance of the bid would result in a violation of holding limits (also discussed below), if acceptance of the bid would result in the bidder owing more to the state than they have guaranteed they have available.

There are significant limits to how entities can buy through this process of price determination. For the first compliance period, in each advance auction no entity may buy more than 25% of the total allowances on offer. In any current auction industrial covered or opt-in entities cannot buy more than 15% of the total allowances offered (except for the last auction in 2014, where the limit is 20%, presumably to allow refineries to prepare for compliance in 2015). Meanwhile, electrical distribution utilities can purchase up to 40% of available allowances in any current auction, while all other participants (speculators or other non-polluting entities) are limited to 4% of the total allowances being auctioned. These purchase limits are somewhat simplified in the second and third compliance periods; no entity can buy more than a quarter of the allowances offered in either current or advance auctions, and non-compliance entities, like speculators, are still limited to 4% of the total. This 4% counts either for a single voluntarily associated entity, or for a group of VAEs that have direct corporate associations (discussed above). VAEs

with a direct corporate association to a compliance entity may still buy up to 4%, but that counts against the compliance entity's 25% maximum threshold.

In conducting the auction, there are a number of formalities to which the regulator must adhere. Some of these functions have been contracted out to compensate for a lack of state capacities, including the designation of a financial services administrator, a task that was contracted to Deutsche Bank, and the designation of an auctions administrator, contracted to MarkIt. The choice of MarkIt for auctions administration is interesting, given the company's primary business is in derivatives analytics as discussed in Chapter 4. The functions retained by the ARB in the conduct of auctions is largely comprised of publishing relevant information for auction participants, including the date and time of auctions, the requirements for participants and instructions on how to fulfill those requirements, the way in which bids are to be submitted, and the number of allowances available at a given auction. Additionally, the notification for the first auction of any year has to include the total number of allowances that will be on offer over the course of the year and what the floor price will be for those auctions; this information could be useful for compliance entities planning their compliance strategies and prevent against the possibility of price shocks were the ARB to change the aggregate supply available in the auctions.

In order to participate in the auctions, an entity must be registered in the cap-and-trade program pursuant to the requirements discussed above. Entities must have at least a holding account in good standing with the ARB and not have had that account suspended or revoked for reasons discussed below. At least thirty

days prior to an auction, any entity that intends to bid for the first time must submit an auction participant application that details corporate identity and ownership and capital structure (for determining direct or indirect corporate associations) of the entity, a description of how allowances purchased are to be distributed among members of a corporate association, an attestation disclosing any new or ongoing investigations that pertain to violations of any, “rule, regulation, or law associated with any commodity, securities, or financial market,” (221) for any entity associated with the bidder if that entity is involved in markets for carbon, fuel, or electricity. The individuals who will actually submit the bids must have completed the state’s ‘know-your-customer’ attestation discussed above. Entities already registered to bid in the auction do not need to complete new applications for each auction unless relevant information has changed since their application was processed. Any change must be registered with ARB at least thirty days prior to the auction or that entity can be denied access to the auction; however, even already-registered entities must notify ARB of intent to bid at least thirty days before the auction or they will be denied access. Once approved to participate, no entity may share bidding information with anyone else except other companies that are part of a corporate association in order to prevent collusion.

In addition to these informational requirements to bid, there are stringent financial guarantee requirements for bidders. All bids are considered binding agreements to purchase the stated number of allowances up to the price indicated by the bidder. In order to purchase these allowances, bidders must submit bid guarantees at least 12 days before the auction to the financial services administrator

in some combination of cash (as a wire transfer), an irrevocable letter of credit from a US bank, a bond issued by a US bank, or a surety bond issued by a bank authorized the US Treasury Department. The amount submitted as a guarantee must be equal to or greater than the maximum value of bids submitted in both the current and advance auction, and bid guarantees (if not posted in cash) must be payable within three days of the auction and may not expire any sooner than 26 days after the auction date. As discussed in chapter 4, these bid guarantee requirements are seen as overly onerous by some market observers, who believe that the cash-up-front requirements disincentivize some market players from bidding, dampening liquidity.

After the auction takes place and MarkIt reports the results to ARB, the Executive Officer of ARB will review the mechanics of the auction and certify whether the conduct of the auction met the regulatory requirements. If the mechanics are in order, ARB will direct the auction administrator to notify winning bidders of the market clearing price, the number of allowances the bidder was awarded and the total price of those allowances, and the deadline and method for submitting payment. Winning bidders can submit cash payment within seven days of receiving word of their successful bids; winners who fail to do so will have their bid guarantees called in if they fail to submit cash within those seven days. The financial services administrator (Deutsche Bank) will then move the money collected from winning bidders into the state's Greenhouse Gas Reduction Fund from which the state can then spend on projects designated by the legislature. Some portion of the proceeds will also be distributed to any electric or natural gas utility

that consigned allowances for auction as described above. Finally, any money value from bid guarantees that was unspent will be returned to the relevant entity. Once all financial movements have occurred, ARB will move the appropriate number of allowances into the holding accounts (or into compliance accounts in case placing them into holding accounts would violate holding limits) of winning bidders and inform Quebec regulators as to the distribution of the serial numbers of individual allowances. Finally, the regulator will publish the names of all bidders, the auction settlement price, and aggregated, distributional statistics on purchases with the names of all entities withheld. The content of these auction reports were long a source of conflict between regulators, compliance entities, and environmental NGOs, who each wanted different levels of disclosure, with polluters seeking the lowest level of information reporting and green groups advocating for the greatest transparency to allow for public oversight of allowance purchasing behaviors. The state ultimately ended up with this compromise to satisfy the public's need to know and to maintain confidentiality of purchasers' market strategies.

The mechanics of purchasing allowances from the Allowance Price Containment Reserve, or what can be thought of as the pressure release valve on prices, follows a similar process as that of auctions, except as far as price determination goes. The same financial services administrator conducts the sale, but it is open to far fewer participants than the quarterly current and advance auction. Only California-based compliance entities can buy allowances in this way, and their account representatives must have completed all the same requirements as for the auctions and notification of intent to buy in the reserve sale has to be

posted to regulators at least 20 days before the sale. These sales are scheduled for six weeks after each auction, though none have actually taken place.

Were these reserve sales ever to take place, the regulators would offer allowances at three starting price tiers as of 2013; \$40, \$45, and \$50 per allowance. These prices then escalate in line with the floor price, increasing 5% plus inflation annually. That prices 2015's reserve tiers at \$45.20, \$50.86, and \$56.51 per ton. Each tier contains 40,611,000 allowances (ARB 2014). In addition to these allowances, this section includes a further demand relief valve in the event that the total demand in the reserve sale immediate preceding the compliance event that encompasses an entire compliance period's surrender on November 1, 2015. In the event that all allowances from the APCR were to be sold at all three tiers, a further amount of allowances equal to the total demand signaled by willingness to pay for allowances at the top tier price would be released for purchase, drawing down allowances from the reserve fraction apportioned first from 2013-2014, then from 2015-2017, and finally from 2018-2020. This is the one of the rare instances in the regulation when 'future' allowances can be used for current compliance, effectively borrowing against future allocation.

Many polluters and their industry groups have argued for a more robust cost-containment mechanism whereby unlimited allowances would be sold at the highest price in case demand were to reach that level, but so far regulators have resisted 'breaking' the cap in this way. Further, the order in which vintages are drawn down come in reverse order, with allowances from the last compliance period being

drawn from first, and allowances purchased from the reserve are the first to be used for compliance per the retirement order discussed above. The sale works similarly to the regular current and advanced auctions insofar as bids are tendered for specific numbers of allowances in lots of 1000 at specific prices; however, the floor price at reserve auctions is the lowest tier and the price cannot go above the cap listed for the highest tier. There are a number of tiebreaking procedures and methods for determining what proportion of a given tier is given to each bidder in the event that each tier is exhausted, but given the relative unlikelihood that these tiers will be broached, the reader is directed to section 95913(h)(4-6) for full details. Following the successful conduct of a reserve sale, the ARB and the financial services administrator follow the same procedure in distributing allowances and collecting payment as in the normal auctions.

Having dispensed with the mechanics of current and advance auction and the APCR, the regulation returns to further restrictions on participation in the auctions in section 95914. Previously approved auction participants can be disqualified if they are found to have lied or misled ARB about salient facts in the aforementioned attestations or run afoul of any of the previous rules listed above. Sanctions include being disqualified from the bidding process or having future applications to participate denied, the restriction of any entity in a corporate association to transfer allowances to the disqualified bidder, and these sanctions can be applied to for a specified number of auctions or permanently. These sanctions are in addition to any other penalties or fines assessed for malfeasance.

There are further provisions to inhibit the sharing of bidding information. Under no circumstances are any entities registered into cap-and-trade, including any advisors or consultants they retain, allowed to share any information regarding whether or not to participate in any given auction or price containment reserve sale or even whether their organization is an approved bidder, what their company's trading strategy is, how many allowances they might bid for or what price they might bid at, or information about their bid guarantee. This sort of information is only allowed to be shared among members of a direct corporate association that has not been restricted in its participation for reason of wrong doing, with a consultant who has been registered with the ARB, if the sharing of information is by a publicly owned utility and the sharing of information is required by public transparency rules or the rules governing a combined power generating consortium (known as a Joint Powers Authority), or if the sharing of information by an Investor Owned Utility is mandated by an agency that has jurisdiction over that utility requiring the disclosure of compliance instrument costs and purchasing strategy. If the last of these cases happens, the IOU must alert ARB of the disclosure within 10 days of it happening and the rule or ruling that required the disclosure and what information was disclosed.

Additionally, there are a number of guidelines that all cap-and-trade participants must abide by when they hire consultants to advise them on market strategy. On the hiring entity's part, it is their responsibility to alert their consultant about the sundry prohibitions on information sharing and to ensure that their consultants are not transferring information among other auction participants or

coordinating bidding strategies. All this information must be in to ARB at least 15 days before the auction for which an entity is receiving advice or consulting. For their part, consultants must register with ARB and disclose who they are working for, what sorts of advice they are providing, and give binding assurance that the consultant is not sharing any bidding or strategy information with other auction participants under penalty of perjury. Additionally, pursuant to Section 95923, any entity employing a consultant or advisor must identify the consultant's name, contact information, their physical work address, and their employer if applicable. This information has to be registered within 30 days of entering into a contract with a consultant or advisor, and updated within 30 days of any changes of information relevant to the consultant.

Trading and banking

Subarticle 11 on how CCAs can be traded and banked is perhaps the most important part of the regulation for the majority of the analysis offered in this dissertation. It is no coincidence that section 95920, titled 'Trading' actually begins with holding limits, given the emphasis that regulators have placed on preventing detrimental performances of the markets they have created (see Chapter 4). The holding limit is defined as, "the maximum number of California GHG allowances that may be held by an entity or jointly held by a group of entities with a direct corporate association... at any point in time," (239).

Holding limits are calculated separately for two categories; first for allowances with a vintage year corresponding to the current year or before,

allowances purchased from the APCR, allowances purchased from advanced auctions of a vintage equal or before the current year, and allowances purchased from linked emissions trading systems without a vintage; and secondly, allowances purchased from advance allowances that have a vintage year beyond the current year. The holding limit formula is

$$0.1 * \text{Base} + 0.025(\text{Annual Allowance Budget} - \text{Base})$$

Where Base equals 25 mmtCO_{2e} and annual allowance budget is the number of allowances issued for the current budget year.

The annual allowance budget is comprised of California's annual emissions budget plus the emissions budget of any linked jurisdiction; to date, this is only Quebec; however for this example I will use only California's budget to demonstrate how holding limits are supposed to work. For 2015, the first year in which fuels were brought under the cap, any entity's holding limit for current allowances is 2.5 million plus 0.025 times (394.5 million minus 25 million), resulting in a holding limit of 11.7375 million allowances. This number, however, is clearly not large enough for the state's largest polluters to account for all of their emissions in a single year, much less in a three-year compliance period. To rectify this situation, the next section of the subarticle deals with the Limited Exemption from the holding limit, or the limited exemption. All allowances that are to be included in an entity's limited exemption must be placed in the compliance account, the one-way account from which allowances cannot be traded. The limited exemption is only available to polluters that have a compliance obligation for reported emissions.

The limited exemption came into being on July 1, 2014, and was calculated by adding the sum of annual emissions from a given entity from 2012 and 2013, then subsequently increased on November 2, 2014 to incorporate any further emissions data, and once again on January 1, 2015; the limited exemption is then increased annually on November 2 of each year to account for the previous years' emissions that have been verified. The limited exemption is then reduced each November 2 following the end of each compliance period by the entire sum of the entity's compliance obligation in the preceding compliance period. In this way, compliance entity's limited exemption can fluctuate tremendously depending on the time within the compliance period, preventing any entity from stockpiling allowances early in the compliance period that might drive supply down to an extent that could impact market function.

Entities can petition ARB for expanded limited exemption holdings if they have experienced dramatic emissions output increases in the previous year but before verified emissions data is available. Their calculated, covered emissions must have increased by at least 250,000 tCO₂e (annualized). If the executive officer determines that the petition is legitimate, ARB can then grant the expansion of an entity's limited exemption and the entity can own more allowances in their compliance account; once verified emissions data become available, ARB can then adjust the limited exemption limit accordingly. For future vintage allowances, each vintage year's holding limit is calculated separately, but according to the same formula as the current year limit worked through above. Further, entities that are part of a direct corporate association are subject to the same holding limit for both

current and future allowances; if they have opted to not use a consolidated account they must allocate allowances among themselves, and those allocations must sum to 1. The plans for the division of allowance holding across non-consolidated accounts of directly related corporate associations must be reported to ARB and will remain in effect until the account representative asks to change it.

There are a number of sanctions possible if an entity violates these holding limit rules. All holding limit sanctions exclude allowances held in limited use holding accounts or for the seller of allowances who have exchange clearing holdings accounts, which are temporary accounts for allowances an entity is actively in the process of transferring to another entity either through consignment or trades of the kind laid out in the next section. The recipient of allowances listed in a transfer request of allowances does have those allowances counted against their holding limit. In the event that a proposed transfer would result in the purchaser violating their holding limit, the ARB is not to allow the transfer of allowances to proceed, but in the event that the transfer is executed or an entity violates its holding limits when the calendar year changes and the next year's vintage allowances become current, the accounts administrator is to immediately notify the entity in violation, and that entity will have five days to dispose of excess allowances. Failing action on the part of the entity in violation, ARB can transfer all excess allowances into an entity's Auction Holding Account, whereby the allowances will be offered for consignment at auction.

Now that the mechanisms for auction are laid out, and limits on the number of allowances an entity can own are defined, the regulation gets to the heart of the 'trade' in cap-and-trade: the mechanisms by which the secondary market is regulated. As far as the bookkeeping transfer of allowances, the accounts administrator does not register a change in ownership of allowances until a transfer request has been submitted and approved by ARB. In order to initiate the transfer request, the account representative of the seller must submit the request, and another designated representative of the same entity must confirm the transfer request within two days. Then a representative of the recipient entity has to confirm the transfer within three days of the initial request, but following the confirmation by the second representative of the sending entity. This rather arduous process is designed to prevent the kinds of malicious trading activities that plagued the EU-ETS, or the behavior of 'rogue traders.' Penalties may be assessed if the confirmation process takes more than three days to complete or if the process is completed more than three days after the expected termination date of the transaction agreement that results in the transfer of allowances. The process is not allowed to be initiated unless a written or recorded oral transaction agreement.

As part of the transfer request, the parties must submit the transfer agreement to ARB's accounts administrator, in addition to the holding account number of the sender and the identity of their accounts representatives, the account number of the destination account, and the type, quantity, and vintage of the compliance instruments being transferred. The transfer request must further identify the transaction type for which allowances are being transferred. First are

over-the-counter spot transactions where the transfer of allowances occurs less than three days from the date the contract is agreed; second are more complex trades that involve future purchase agreements (more than three days in the future), or transactions in which allowances are traded in multiple transaction over time, or in which allowances are part of a bundled sale with other products; and third, allowances that are purchased through a contract arranged by an exchange or Board of Trade.

For the first of these transactions categories, the vanilla OTC transaction, contract disclosure requires that the seller submit the date the transaction was entered into, the price of the compliance instruments, and the expected termination date of the contract. This expected termination date is the date that the transfer request is submitted if the transfer is the last term of the contract to be executed; if there are further contingencies to be settled after the transfer has taken place, such as future financial terms, the date those terms are expected to be settled is considered the settlement date; if it is unknown, the transfer request can indicate that the termination date is not specified.

The second class of transactions are forwards transactions and other more complicated OTC transactions. For these more sophisticated transactions, terms that must be disclosed to the regulator include the date the agreement was entered, the expected termination date with the same contingency provisions as the vanilla transaction, indication of whether the transaction agreement provides for further transfers after the current transfer request is finished, if the transaction requires the

transfer of products other than compliance instruments, if the compliance instruments are being sold at a fixed price, and if it does, what the price is either in USD or CADs, if the transaction sets a cost base plus a margin, what the cost base and margin are, and if the agreement does not specify pricing using any of those methods, the method by which pricing was arrived at. For the third broad class of agreements, a transaction that occurs over an exchange, the transfer request must specify the exchange on which the transaction was conducted, the contract description code assigned by the exchange, and the date and price at close of trading for the contract.

Given that price surveillance is a key piece of data gleaned from transfer requests, and by extensions, that putting a price on carbon is the reason for building a market in the first place, ARB had to include special provisions in the event that the transactions between entities are possible that do not price compliance instruments. The ARB includes eight scenarios in which an entity making a transfer request can enter 'zero' as the price of allowances being transferred. These situations include the transfer of allowances between entities in a direct corporate association where ownership of an allowance remains the same but a different operating unit is to control the compliance instrument; if the transfer is to move allowances between a single entity's holding and compliance account; or the transfer is between a publically owned utility and an other entity or Joint Powers Authority that are operating a power generating facility as a joint venture with the POU. Other scenarios include a transfer between a public utility and a federal power authority to account for imported power, a transfer from an electricity distributor to

a power generator who are operating under a contractual long-term power purchase agreement that does not specify a price for the sale of compliance instruments on their own; transactions that bundle carbon with other products and does not specify a price for the compliance instruments on their own; transfers between publically owned utilities and a power generating entity that the POU obtains electricity from; or a transaction that requires the “production” (250) of a new offset credit or the agreement to transition a preliminarily approved offset credit to an ARB-issued offset credit and the contract does not include a price for the ARB-issued offset (much more on the offsets system below).

The regulation includes clarifying instructions for transfer requests involving compliance instruments purchased on an exchange, rather than a transaction between two parties, or two parties and a broker. The transfer request initiated by the seller will stipulate the number of allowances to be transferred into their exchange clearing holding account, from which they must be moved into an exchange’s holding account. The exchange (typically the Intercontinental Exchange in Chicago), will then file a second transfer request to move the allowances into the purchaser’s exchange clearing holding account, from which the allowances must be moved into a standard holding or compliance account within 5 days. If the transaction takes place on an exchange or through a board of trade that does not have its own account, the transfer request process is like that of other OTC transactions, with the slightly different information sharing requirements discussed above.

It is worth noting that at no point during the transfer process do either of the parties ever know the exact serial numbers of the allowances they are trading, only the type and vintage of allowances that are being sold. The rationale for restricting access to serial numbers arises from experience from other regulatory environmental products, like Renewable Identification Numbers in clean fuels programs, that have been subject to fraud when serial numbers have been distributed publically. For offsets trades, the buyer and seller will be aware of the specific project and offset methodology that generated the offsets in order for purchasers to be aware of any offset invalidation risk they might incur through purchasing (more on invalidation liability below). As far as responsibilities of the operators of exchanges with exchange holding clearing accounts, the holder is responsible for maintaining transaction records for 10 years and that information must be surrendered to the ARB within 10 days of any request.

ARB recognized that much of the data that is required for them to track market actions is highly sensitive and the rules include provisions for the protection of sensitive information. The accounts administrator is allowed to publish information on transfers that have taken place in terms of quantity of allowances and price, but must otherwise maintain confidentiality of the participants. This provision allows the price signal to remain knowable between auctions. All other information included in transfer requests is to remain confidential except in cases where the Executive Officer determines the information is material for reasons of market oversight or investigation. The accounts administrator is to protect the confidentiality of the quantity and serial numbers of allowances in holding accounts

from where they are still able to be traded, while they are to release information about the total quantity of compliance instruments that are in compliance accounts in a timely manner in order to give program participants actionable data on the number of instruments that are potentially obtainable to fulfill compliance obligations by giving the public data on the available supply of tradable instruments.

The regulation then returns to further trading prohibitions, largely structured around the concept of 'beneficial holdings' that could be used to circumvent holding restrictions. Entities are prohibited from holding allowances that another entity has an ownership interest or holding allowances under an agreement that grants de facto control of how any allowances (or their monetary value) will be used to another entity except in the case where a forward transaction arrangement exists between those two parties that has been reported to the ARB. Having stipulated that entities can largely only hold instruments for their own benefit, there are a number of trading activities that are explicitly prohibited. Interestingly, these prohibitions are largely quite broad in contrast to the aching specificity of so many other provisions in the regulation.

For example, prohibited trading activities include (pursuant to Section 95921(f)(2)):

- (A). Using "any manipulative or deceptive device in violation of this article"
- (B) Any attempt at cornering a market for any compliance instrument
- (C) Fraud or any attempt thereof
- (D) Any misleading or inaccurate report of about information that does or "tends to" affect the price of compliance instruments

(E) The filing of any report, application, or other information that is required that is false, misleading, or intentionally incomplete with regards to a “material fact”

(F) “Any trick, scheme, or artifice to falsify or conceal a material fact” in any statement or oral or written representation made to any entity that is involved in the circulation of compliance instruments

(G) “A fact is material if it could probably influence a decision by the Executive Officer, the ARB, or the ARB’s staff”

This final prohibition is especially striking, as it essentially articulates a counterfactual articulation of a proof standard.

The next subarticle lists the penalties for failure to comply with any of the above procedures or engages in prohibited activities. Compliance entities may have their holding limit in their holding accounts limited below the statutory limit or increase their annual surrender requirement above the 30% threshold for compliant entities discussed above. Entities that have opted in to the program or are voluntarily associated can have their registration revoked all together. If this measure is taken, the suspended or revoked entity has 30 days to either voluntarily retire or sell all compliance instruments it holds in its compliance account. If it fails to do so, the accounts administrator will seize whatever instruments are in the holding account and offer them for consignment. Other sanctions include the limitation or prohibition of an entity transferring allowances in or out of its holding account, or any combination of the above.

In the event that a transfer request is found deficient before it is executed, the accounts administrator is to inform both the parties submitting the transfer request and the Executive Officer of the deficiency. The accounts administrator will alert the party at fault for the deficiency of the specific missing or incorrect

information and the entity will be given the opportunity to correct the errors or withdraw the transfer request; however those corrections or withdrawal and resubmission must happen within the three day limit of transfer requests or they will be subject to the sanctions discussed above. If the accounts administrator does not catch the deficiency until after the transfer has been processed, they will alert both parties to the trade and the Executive Officer. The Executive Officer will then inform the offending party of the specific deficiency and the offender will have five days to rectify the error or the transfer may be reversed.

Linkage to external GHG emissions trading systems

California's cap-and-trade market was originally conceived of as part of a much broader network of markets that would encompass the western United States and Canada under the auspices of the Western Climate Initiative (WCI). However, as discussed in Chapter 5, nearly every jurisdiction that was originally party to the WCI dropped out following the 2010 midterm US elections, leaving California to 'go it alone'. California operated its market as a stand-alone for 2013 and much of 2014, before the market was formally linked to Quebec's market, a process that required significant policy harmonization. Regulators continue to press for other jurisdictions to create markets to which they could link California's which has a number of benefits according to economic theory, particularly increased liquidity and diversified sources of greenhouse gas emissions and reductions. However, to date, linkage remains only between California and Quebec. Most of this harmonization work begins before the regulatory requirements kick in. The fundamental idea hinges on the universal fungibility of greenhouse gas emissions, codified as, "A

compliance instrument issued by an external greenhouse gas emission trading system may be used to meet the requirements of this Article if the external GHG ETS and the compliance instrument have been approved pursuant to this section...” (§95940, p.259).

The administrative procedure for linking California’s cap-and-trade program to other emissions trading systems is not fundamentally different from any other major change to the program; the proposal must be given a public notice and provide a public comment period that follows the rules of California’s strict Administrative Procedures Act, and subsequently be approved by the full Air Resources Board. This, of course, is contingent of the aforementioned harmonization of quantification regimes, ensuring that offsets protocols are of equal rigor, and that rules for compliance periods and the timing of compliance events are similar enough to not cause massive supply/demand fluctuations. Once the board approves of linkage, all instruments, both allowance and offset, achieve immediate fungibility with California instruments. Offsets credits issued by linked jurisdictions are still subject to the 8% compliance surrender limit, while allowances issued by linked jurisdictions are subject to regulation in a similar fashion to California-issued allowances; that is, external allowances are not treated as offsets because the presumed fungible emissions that embodied in the allowance will come from an industrial sector that is also subject to California’s program as a condition of harmonization. The regulation also includes provisions for ensuring that California allowances that are used for compliance in linked jurisdictions are retired and their

serial numbers noted by both jurisdictions to prevent double counting or non-counting.

With the provisions on linkage the details of the regulatory apparatus for the exchange of compliance allowances is largely complete. From here, the regulation goes on to consider offsets, a key part of the program and the subject of much political maneuvering. Given that the primary focus of this dissertation is the compliance market and the performance thereof, this section will only discuss a rather broad overview of the offsets program, going into detail on some key facets that impact the analysis in subsequent chapters. In particular, I will focus on the variety of offset protocols approved by the board, provisions for liability in the event that an offset project fails to deliver promised emissions reductions, and some of the jurisdictional concerns that arise in conducting offset projects outside of the state of California. I will exclude in-depth explanations of the rather convoluted process of offset project development, registry, and verification, providing only a high level overview. Interested readers are encouraged to consult Subarticle 12 of the cap-and-trade regulation for details, or visit the websites of the two state-authorized offsets registries for technical details.

ARB offset credits and registry offset credits

Offsets are considered to achieve two primary goals in cap-and-trade programs. On the environmental side, they can be used to incentivize emissions reductions in sectors outside the cap. In California, this limits the types of activities that can even be considered for offset protocols because the compliance program is

supposed to cover 85% of the state's emissions to start with. However, significant emissions from agricultural activities remain outside the cap, and this is one of the primary foci of the offsets program. On the economic side, the use of offsets has two functions, one internal to the program, the other external. Internally, the use of offsets is considered a price containment mechanism, because offsets credits are generally priced lower than commensurate allowances for a variety of reasons. Offsets are less expensive than allowance credits due to the fact that their use-value is constrained by limitations on the number of offsets compliance entities can use to fulfill their compliance obligations and because the purchaser faces additional risk that the offsets might be invalidated by either ARB or verifiers, rendering those offsets without a use-value, and hence exchange value. Empirically, offsets can be bought at a 20-30% discount in comparison to allowance credits depending on the offset protocol that was employed in the creation of the offset (californiacarbon.info 2014b). Externally, offsets are a way that the cap-and-trade regulation can engender changes to the wider California economy by creating incentives for project developers to engage in material value creating activities, heralding the much touted 'green collar economy'. While I spoke with several interlocutors who work on the offsets side of the regulation, I cannot speak to the degree to which offsets projects have fomented green job creation, particularly given the low prices that offset credits currently command.

The key definition that animates the entire offsets program is the first provision of Subarticle 13 that stipulates that offsets must, "represent a GHG emission reduction or GHG removal enhancement that is real, additional,

quantifiable, permanent, verifiable, and enforceable” (261). This is more or less the same criteria that have been used in the development of offset schemes across diverse natural asset classes and in most carbon offsetting schemes, including the Clean Development Mechanism of the Kyoto Protocol (see especially Lohmann 2011 on the notion of ‘additionality’). The regulation goes into a bit of detail on each of these components, though not on a project-by-project basis, but rather as requirements for ARB approval of any new offsets protocols, which the regulation advises should be updated periodically. This was a point of contention in the early design of the offsets component of the regulation, with some members of the offsets industry and the polluter community arguing that rather than limit the types of projects that could generate credits, any emissions reduction project should be eligible if developers could prove that the project complied with the criteria above. However, regulators ultimately went with a standardized approach for a limited number of offset protocols.

In order to be considered for inclusion in the offsets program, a protocol for GHG reductions external to compliance regulated activities had to be able to determine, “the extent to which GHG emissions reductions and GHG removal enhancements are achieved by the offset project type” (262) by formalizing practices for data collection and monitoring of those projects. Offsets protocol authors would need to devise standards by which project baselines are set, reflecting the counterfactual future against which project performance could be judged. The way this is phrased is that baselines should reflect, “a conservative estimate of business-as-usual performance” (262). Offsets protocols should not

engender leakage, as discussed above, deploy a quantification system that is capable of accounting for uncertainty, and ensure that emissions reductions are permanent (within significant constraints discussed below). Further, offsets protocols must establish time periods in which offsets credits accrue (periods of 7-10 years for GHG destruction or 10-30 year for GHG sequestration, including biological sequestration), and compliance protocols are only eligible to be deployed in the US and its territories, Canada, and Mexico. Another temporal constraint is that in order to be eligible for offset credits, the offsetting activity must have take place no earlier than 2007, except for a special subset of offsets called 'early action offsets' that will not be discussed below. To date, the ARB has authorized five offset protocols: the destruction of ozone depleting substances, destruction of livestock methane, urban forestry, US forestry, and the most recently approved protocol, mine methane capture. A sixth, for emissions reductions from rice cultivation, is currently under consideration. It is interesting to note that each of the first five approved offsets methodologies require some level of on-the-ground measurement to verify that projects are meeting their GHG goals, while the rice cultivation method will rely entirely on modeling to determine the number of credits generated through projects.

Rather than a close reading of the entire offset regulation, I will present here an overview of how offsets projects go from proposed activities to credit-generating interventions. While I will still draw from the regulation, the primary document under analysis in this section is chapter 6 of an ARB guidance document dated 19 December 2012, entitled, "What are the requirements for offsets credits and how

are they issued?” From there, I will return to the regulation itself discuss the ways in which offsets credits are allowed to circulate as fungible GHG representations that can be used to fulfill 8% of entities’ compliance obligation. From a regulatory perspective, an offset project begins when a project developer registers with both an offset registry and with the ARB. There are two registries that are approved by ARB to list pre-compliance offset projects; once the projects have been completed, they can be awarded credits that are tracked in the CITSS tracking system. The two approved registries are the American Climate Registry (ACR) and the Climate Action Reserve (CAR). Each of these registries is allowed to list offset projects and provide technical guidance to customers in the development of offsets projects. In order to register with the ARB, offset project developers must be in good standing with the ARB and not have had their holding accounts (discussed above) suspended or terminated. This reflects the fact that ARB cedes no authority in the development of protocols or the issuance of offset credits to any other authority, allowing it to maintain control of the offsets program in ways that other offsetting programs, both regulatory and voluntary, have not been able to do.

The key actors in the creation of offsets credits are the ARB, offsets registries, and project developers and their contractors, and ARB-certified verifiers. Project developers range from corporate actors who have formed businesses specifically to do offsets projects for the California carbon market to American Indian tribes seeking to monetize sustainable forestry practices. To commence the process of generating ARB offset credits, the project developer (in the jargon of the regulation, the OPO, or offset project operator) will log into their registry account with either of

the two approved registries and upload all of the relevant documentation for the project for which they hope to claim credits from. The OPO may also employ an 'Authorized Project Designee', effectively an implementation contractor that must be registered with ARB and can only be changed once annually. Both the OPO and APD must be registered with ARB, but only the OPO has to be signed up with a registry (and pay all the attendant fees). Once the OPO has completed basic registration with corporate information and other basics, they must inform the registry of the fundamental project set-up (i.e. protocol and location), make the registry aware of what authorized verifier they have selected, and provide the registry with quantified information relating to the tons of GHGs that the project will destroy or sequester using ARB-approved quantification methodologies for each offset protocol.

Once the OPO has provided all relevant information to the offset registry, the registry reviews all of the documents provided, and if approved, will list the project as a 'proposed project' within the registry system. Both registries operate public databases from which some information about each project can be seen. After a project has been approved as proposed, the OPO may then provide the registry with an offset project data report, which is effectively a detailed questionnaire that provides salient context to the offset project. For example, the American Carbon Registry's offset project data report for US Forestry projects requires OPOs to provide substantial information, including supporting documents, on the legal ownership status of the forest, the composition of the forest that is being conserved or enhanced including information on the proportion of native species that

comprise the forest, the alternative land uses from which the forest is being protected including the stand's proximity to urban areas or potential for mining, and a detailed carbon stock inventory of the forest, ranging from standing trees to soil sequestration. A description of the methodology by which each previous quantification was achieved is required as well.

In addition to this data, the initial data report requires detailed economic base-lining information, including what the highest exchange-value use of the land is and provide for various uncertainty thresholds both in existing carbon stocks and sequestration potentials. OPOs are further asked if the land on which the project is taking place has ever been part of other offsets projects, including voluntary projects since forestry projects (and all offset methodologies) are only supposed to credit for real emission reductions or avoidances. To support this, offset project operators may support any number of documents including maps that show water features, proximity to urban areas, topography, existing land use and land cover, and a number of other features that are supposed to support the rigorous quantification of sequestration potential on the land in question and over which the OPO has authority to make land use decisions for.

After this comprehensive data report has been submitted, and the OPO further inputs data on the expected GHG reductions and the expected reporting period and crediting time frame of the project, the work of verification can begin. Offset registries have a pre-populated list of credentialed verifiers from which OPOs can select. However, before verification can begin in earnest, the verifier must notify

the offset registry of its intent to begin verification on a project. Ten days after the notification, the verifier may begin work on the project. Additionally, the verifier must make an attestation that it has no conflict of interest between itself and the entity that is contracting it for offset verification services. After this data has been submitted to the registry, the initial verification of data by ground-truthing and document review can be conducted. The specifics of what that entails varies from project to project and can range from tree measurements in urban forestry projects to cattle head counts for livestock methane destruction. Once this process concludes, the verifier will submit their report to ACR, along with an attestation that the verifier is not in violation of regulatory requirements that are designed to prevent individual offset developers and verifiers from malfeasance by restricting the number of times a verifier can work with a project developer before a new verifier must be employed.

If the registry is satisfied with the verification statement and the verifier statement supports the offset project, then the registry can issue serial numbers for each ton of avoided emissions. These serial numbers are credits, but they cannot be used (yet) for compliance with the ARB's cap-and-trade program. Instead, they are referred to as Registry Offset Credits, or ROCs. Once ROCs have been issued to the OPO's registry account, they can be transferred into the accounts of other registry participants, voluntarily retired, or cancelled as they transition to ARB issued offset credits, or ARBOCs. For this transition, the OPO must submit all relevant documentation to the ARB for review, and the ARB may request further information from the registry. Once ARB is satisfied that a project meets its requirements for

offset credits, it will alert the registry to cancel the serial numbers of offsets that are transitioning from ROCs to ARBOCs. At that point, the ARBOCs appear in the OPO's holding accounts in the CITSS system, from which they can circulate according to the rules described above, having achieved full fungibility with other data-represented quanta of greenhouse gases.

Once offsets transition from registry credits to ARB-issued offsets, there are several continuing issues that must be addressed that are of importance to the function of the program and to the analysis in the substantive chapters that follow. The first of these are crediting periods for projects that are designed to deliver ongoing emissions reductions or sequestration of GHGs, like forestry or methane digestion over the lifespan of an offset project. The second is more directly related to compliance and financial matters dealing with where liability resides in the event that ongoing verification determines that the promised emissions reductions are not, or have not, been delivered, or the offsets were generated under circumstances that contravene ARB's regulatory stipulation that offsets projects comply not only with cap-and-trade rules, but with all other applicable environmental statutes.

Crediting periods differ between offset types. Non-sequestration project, like the destruction of ozone-depleting substances that only occurs once, can generate credits for between 7 and 10 years, and sequestration projects, like forestry projects, generate credits for between 10 and 30 years. The issuance of new offset credits from existing projects is contingent on further emissions reductions activities, but the prolonged crediting periods are designed to create a reliable

revenue stream from offsets projects to incentivize the further development of projects since they are conceived of as a cost reduction mechanism as discussed in Chapter 5. Thus, a single offset project can produce credits for up to thirty years in the case of a forestry project (though the permanence requirements of forestry projects is 100 years).

Given that offsets must function on such a long timespan, there are additional rules for how long an offset project can be found, retrospectively, to have failed in delivering the emissions reductions promises embodied in serial numbers that represent them. This invalidation can take place as a result of a desk review of documentation or a site visit by a regulator, or as a result of a failed visit by a verification body. The standard window of invalidation possibility is eight years; however, there are mechanisms by which the window for potential invalidation can be reduced to three years if they undergo another verification by a different verifier than the one that conducted the initial review. This has ramification for the trade in offsets, as offsets that have undergone a second verification trade at a significant premium. Traders refer to them as 'golden CCOs' (California Carbon Offsets) or 'CCO-3's.

The premium attached to a shorter invalidation window arises in large part because the regulation stipulates that if an offset credit has already issued but is subsequently invalidated, the serial numbers associated with the project found to be in non-compliance are canceled no matter whose holding account they are currently controlled by. In effect this means that the buyer, rather than the seller, is liable for

replacing offsets found to be invalid. Regulators have demonstrated this to be no idle threat, as a number of offset credits generated by the destruction of ozone depleting substances were found to have been created when the facility where incineration took place was not in compliance with the Clean Air Act. Even though the unlawful emissions that took place were unrelated to incineration of the refrigerants that generated the offset credits, the owners of those credits were still responsible for their replacements. This event continues to have ramifications for the offsets market, as insurance products are being marketed to offset purchasers and the price spread has grown between offsets that have only undergone the base level of invalidation and those that have received certification by a second verifier.

Conclusion

These are the key components of the regulation that has been under construction for over nine years. It is fairly remarkable as a piece of environmental regulation in its ambition, scope, and level of detail to account for contingencies of individual polluters' circumstances, changing economic and environmental conditions, and the political climate in which it has been implemented. While it appears in this form as a finished piece of regulation, modifications are always under consideration, largely because of the wide latitude regulators have been granted by the authorizing legislation. The regulation has already undergone five significant revisions, and it is likely that revisions will be under consideration through the life of the program. The subsequent chapters will deal with specific negotiations that went into the crafting of this regulation, what the outcomes of

those negotiations were, and what sorts of impacts those outcomes have had in the function of the cap-and-trade program so far.

Chapter 3: Carbon in Parallax

Over the last decade, it has become commonplace for political ecologists, critical nature-society geographers, and various activist groups to decry rapidly proliferating schemes that commodify nature. While these schemes are undoubtedly of dubious environmental value and contribute to the ‘financialization of everything’, the very commodity-ness of the things that are being created have been taken more or less as an article of faith. Smith (2007) wrote of ‘the real subsumption of nature by capital’, wherein environmental degradation would become even more entrenched in the capitalist world ecology (Moore 2011) because capital would be able to circulate through those physical spaces that it had formerly been unable to penetrate. However, there is increasing recognition that many of these commodification regimes have been abject failures not only in terms of their environmental outcomes, but for capital and its state enablers as the private investors these markets seek to enroll have failed to materialize. And yet, new carbon markets, payments for ecosystems services schemes, and a plethora of environmental derivatives continue to proliferate.

I argue that the real subsumption of the atmosphere that allows polluters to capture surplus value through commodification cannot take place through the kind of market mechanism that California has put in place because the atmosphere is never fully commodified in the sense that the atmosphere, per se, is not repurposed as a circuit of capital accumulation. Instead, the state is extracting rents from the surplus value produced by polluters in the course of their business practices through a financial product that looks like a commodity, but in fact only bears the

commodity form. This commodity form is complicated by two distinct, but overlapping parallaxes (Zizek 2009), or the incommensurate understandings that arise when viewing a single object from different perspectives. I demonstrate these parallaxes by expanding from a strictly economic definition of value to cross into realms of the cultural and semiotic wherein *values* must be mobilized and reconciled by the state rather than in the arena of pure exchange value. In this case, the California carbon allowance (CCA) comprises two apparent contradictions. The first arises in the competing valuation regimes embodied in defining the use-value of CCAs, which ultimately amounts to the ability for regulated industry to comply with the regulation itself. The second central contradiction is the unbridgeable gap between the CCA's use and exchange value that is exacerbated by the absence of human-nature labor in the creation of value in defining the commodity itself. This absence results in an inversion of the order in which value is realized.

Complicating the value form in California

Much of the literature on the commodification of greenhouse gases is focused either on regulatory misadventures in the European Union Emissions Trading Scheme (Paterson and Stripple 2012), the catastrophic failures of the CDM (Lansing 2012, Bumpus and Liverman 2008), or potential problems of commensurability in hypothetical REDD+ projects (MacAfee 2008, and see Blanchard and Vira 2015 for REDD+ in California) each of which are useful for synthetic accounts of the financialization of the atmosphere. But none directly confront the commodification process of the regulatory composition of carbon commodities, and particularly those that originate from subnational scales, which come with their own bundle of

oddities. These subnational programs are taking on increasing importance as the proponents of climate markets achieve tenuous hegemony in upcoming supranational climate negotiations. Business groups and mainstream environmental NGOs are aggressively expanding their lobbying efforts in subnational jurisdictions as a way of pushing for global coverage of markets ‘from the bottom up’, as opposed to top-down, which has failed at every COP since Copenhagen in 2009 (Forrester 2014, IETA 2014).

The transformation of previously non-existent data about nature into use and exchange value bearing financial instruments in California’s carbon market is not necessarily a step on the road toward the real subsumption of nature by capital. If these instruments were representative of the condition of real subsumption, they would become conduits for actions through which capital could both reproduce itself and the conditions of its reproduction. Instead the primary institution reproduced through these projects is the state. It is possible to make this argument strictly through a Marxian-theoretical lens, as Felli (2014) as done recently in *Historical Materialism*. In contrast to Felli’s approach to thinking about value through the commodification of nature that focuses on supranational carbon trading in a somewhat idealized form, this article is concerned with how competing regimes of value confront one another through the policy process, and the resulting gaps that are created, smoothed, and constantly reemerge. While Robertson (2006) has used Luhmann’s notion of spheres of articulation to good effect in explaining how regulatory commodification relies on negotiating incommensurable knowledge regimes in a similar, though distinct, case, here we will pursue a different line of

inquiry, through understanding the different valuation regimes brought to bear on the creation of a carbon commodity. In this regard, regulatory cap-and-trade markets in environmental pollutants are fundamentally different than that of other ecosystems services, or even carbon offsets, in that the creation of a carbon allowance does not hinge on any material intervention. Instead, the state brings these regulatory markets into being solely through administrative fiat on the basis of estimated material throughput in polluting activities ascertained through self reporting to a greenhouse gas surveillance mechanism and then calculated through estimates of the relative atmospheric warming potential of different greenhouse gases. While the California cap-and-trade program creates two distinct types of financial products, the CCA (or allowances created by the state) and offsets, this article will focus primarily on the former, as the ‘vanilla’ product of carbon marketization remains under-theorized in comparison to the volume of (outstanding) work available on the offsets trade.

David Graeber (2001, 2005, 2013) outlines a more expansive theory of value that is useful for exploring the overlapping value systems at work in the creation of CCAs. This idea begins with the premise that value is not a thing, but a set of social relations that turn on material actions. This conceptualization allows for a Marxist formulation of economic value on one hand, but additionally, more cultural understandings of value on the other. In addition to Marxist value theory, I will explore Graeber’s (2005) other two registers of value, the moral valence that is imbued in the CCA through the actions of regulators to impose a carbon price because they feel compelled to “do something” about climate change, and his third

category of value, the semiotic, or as he puts it, value as the creation and maintenance of 'meaningful difference', or 'value as contrast' (439). The value of meaningful difference can be explained through the constructions of metrological regimes that create discreet representations of greenhouse gases, attribute unique serial numbers to them, and allow them to circulate as commodities that bear a use-value, even if that use value is purely of a regulatory nature.

Conflicting motivations and attitudes are to be expected of a process that pits the environmental and economic goals of the state against the logic of accumulation. These conflicts can be understood as parallaxes, or the apparent displacement or incommensurability when viewing something from different perspectives. The parallaxes in the CCA are engendered when industry and state confront one another with value regimes that sometimes overlap and at other times are completely foreign to one another through the practices of creating the financialized representation of emissions reductions. Once we have identified the unbridgeable gaps that force controversies in the definition of the commodity to remain subject to contestation and redefinition, or 'hot' in Callon's (1998) words, we can push forward with an analysis of the financial representation of an absence of greenhouse gas emissions that is attuned to the gaps in its definition. Doing so allows us to return to the more familiar terrain of Marxian value theory. Drawing on Mazen Labban's work on parallax, we can think through the gaps that are further engendered when regulators and speculative market interlocutors perform the already fractured representation of environmental benefit as a financial representation of carbon as a factor of production on one hand, and an instrument

of pure speculation on the other. Ultimately I will try to suture these two theoretical strands together by getting back to empirics in order to ask where value is accruing as the result of all this time and effort on the part of the sundry actors who are attempting to value representations of climate change gases semiotically, economically, and to some extent, morally. I suggest that subnational carbon markets' primary role in the economic value system is circulatory and redistributionary rather than originary, thus indicating that capital in the form of M-C-M' is not occurring in the marketization of greenhouse gases because there is no 'C', per se.

Instead, as Brett Christophers (2013) has noted in the case of the other kinds of immaterial financial derivatives, the carbon commodity becomes another exotic financial artifact that actors can use to capture some part of the finite amount of surplus value in circulation through novel leveraging techniques. A primary actor is the state which must reproduce itself financially and fulfill the semiotic imperatives that animate its own reproduction, all while using other administrative tools to achieve its environmental goals. I will demonstrate the state's attempt to capture value by exploring the dire financial situation in which California found itself during the most intense period of commodity definition on which the marketization of pollution hinged. I will examine how the rhetorical weight and purpose that was accorded to raising state revenues stood in stark contrast to the idealized *raison d'être* of carbon markets, in that markets are theorized by their proponents to reduce regulatory burden on polluters and create least-cost emissions reductions through the commodification of pollutants.

Ultimately, I seek to confirm Felli's (2014) recent argument that the outcome of the creation of various regulatory carbon, ecosystem services, and biodiversity markets is not necessarily the real subsumption of nature by capital, but an accumulation strategy on behalf of the state hinging on rent extraction. Rent is a notoriously tricky subject, and all the more so when discussing physical properties of the earth that are not strictly land. As Harvey wrote in the *Limits to Capital* (1982),

Private persons can, under the laws of private property, acquire monopoly powers 'over *definite portions of the globe* as exclusive spheres of their private will to the exclusion of all others (Marx 1971, 615). Since the land is monopolizable and alienable, it can be rented or sold as a commodity. Certain circumstances arise in which clear private property rights are hard to establish- *air*, moving water, and the fish the swim therein, for example. *We will not consider such problems here* (334, emphasis mine).

J.H. Dales (1968a), one of the intellectual forerunners of pollution markets, made a remarkably similar observation in 1968, writing that, "We also say that a government "owns" the air or the water systems within its jurisdiction. Air and water create special problems partly because they are "natural" assets... and partly because they are mobile, "flowing" resources" (61). This paper will demonstrate that assigning property rights to the atmosphere is a problem that is more-or-less insurmountable; indeed California's climate regulation specifically states that holding a CCA *does not constitute a property right* (ARB 2015). A CCA can never be owned, and so is not property per se. The object (the CCA) is not any physical space or volume per se, but instead a purely virtual space defined through metrological practices. These practices form a part of the semiotic value that accrues within the

CCA's use-value, and through which exchange-values can circulate and be accumulated and, importantly, from which rents can be extracted by the state.. "In Marx's analysis of ground rent, this power of extraction accrues to a specific class, the landed property, which is 'based on the monopoly by certain persons over definite portions of the globe, as exclusive spheres of their private will to the exclusion of all others' (Marx 1968, p 608, cited in Felli 2014, 269). In this case, those 'certain persons' are embodied in the state of California, representing the classic capitalist-state need to reproduce the conditions of production through both the extensions of the value form alongside the socio-natural imperative of preserving those conditions on a wide scale, which is simultaneously translated into the moral value of 'doing something' about climate change.

The moral value of regulating climate change

The state of California has a long history of being at the cutting-edge of environmental regulations. California has pioneered auto fuel efficiency and tailpipe standards, multi-scalar governance approaches to improving regional air quality, and the use of market-like mechanisms to achieve reductions in harmful criteria pollutants like SO_x and NO_x. Indeed, regulators and politicians are quite proud of this legacy, while polluters complain that the stringent standards on so many fronts creates the most arduous regulatory environment in the world (manufacturing industry lobbyist interview, Sacramento, September 17, 2013). Despite criticisms coming from polluting industries and anti-regulatory lobbying groups from across the US, Californians by-and-large pride themselves on demonstrating leadership in forging solutions to environmental problems. Indeed,

Governor Schwarzenegger signed the bill authorizing the creation of a carbon market in California, Assembly Bill 32, The California Global Warming Solutions Act of 2006, under a banner that read “California Leadership Solving Global Warming.” This sense of moral obligation to ‘do’ something about climate change is the underlying valence of value that animates the commodification of greenhouse gases in California in the first place (Brown 2014; regulator interview, Sacramento March 1, 2014). This notion of the importance (value) of reducing greenhouse gas emissions is enshrined in the text of the Global Warming Solutions Act. Section 38501, part c-d reads,

California has long been a national and international leader on energy conservation and environmental stewardship efforts, including the areas of air quality protections, energy efficiency requirements, renewable energy standards, natural resource conservation, and greenhouse gas emission standards for passenger vehicles.

The program established by this division will continue this tradition of environmental leadership by placing California at the forefront of national and international efforts to reduce emissions of greenhouse gases. National and international actions are necessary to fully address the issue of global warming. However, action taken by California to reduce emissions of greenhouse gases will have far-reaching effects by encouraging other states, the federal government, and other countries to act. (AB32, 38501, emphasis mine).

This does not, however, imply that environmental protection is the state’s only objective. The state’s position on mitigating climate change has always been plural. The text of Assembly Bill 32 that Schwarzenegger signed specifically charged regulators with creating programs that would have the lightest impact on the underlying economy. AB32 specifically states,

It is the intent of the Legislature that the State Air Resources Board design emissions reduction measures to meet the state wide emissions limits for greenhouse gases established pursuant to this division in a manner that minimizes costs and maximizes benefits for California's economy, (AB32, 38501, part H)

This signifies the state's need not only to preserve the value form of capitalism, but to stave off economic crisis (and attendant political crisis) through perpetual growth in a carbon constrained future.

While not everyone I spoke with over the course of fieldwork, nor every document submitted by policy interlocutors, agreed that a carbon market, or even a carbon cap, were the best way to go about reducing the state's climate footprint, there is an underlying consensus that it is a moral responsibility of the state to demonstrate 'climate leadership', preferably with other states as partners, but if not, so be it. Ultimately California has found itself 'going it alone'³ in pursuing statewide emissions reductions, which has had profound consequences for the exchange of carbon allowances (See Chapter 5, Cullenward and Weiskopf 2014, Roberts 2014). This moral obligation also helps make sense of why so much work has been devoted to the somewhat Sisyphean task of reducing the climate pollution of a jurisdiction that emits around 1% of aggregate global emissions⁴ by 20% in 2020, or to calculate it out, emissions reductions that are roughly 0.2% of global GHG output (ARB 2011).

³ While California's carbon market launched as a single jurisdictional program, it is now linked to Quebec's cap-and-trade program. However, Quebec's emissions are about one-tenth of California's and as the states/provinces do not share a border the two jurisdictions cannot coordinate action of proximate emissions from power generation, one of the most challenging parts of regulating GHGs.

⁴This is based on California's emissions by production, a clearly problematic metric, see Bergmann, 2013 on re-estimating climate impact by consumption.

The 4th Assessment Report of the IPCC indicated that in order to avert climate change of greater than 2 degrees C, developed countries on the whole would need to reduce emissions by at least 25% (Levin 2013). Nonetheless, regulators, their legislative enablers, and NGO backers reiterate with some regularity that something must be done about climate change, and if California doesn't do it, no one will.

Delving further into the moral valence of values that animates the process of greenhouse gas regulation in California, it is critical to recognize the zeal with which regulators and their environmental NGO interlocutors have worked on the program. This is evident not only from the level of resources that the state has allocated to the creation of cap-and-trade, which are substantial in a time of austerity as discussed below. In discussions with high-level administrators at the Air Resources Board and key environmental stakeholders, it became clear that these market architects did not see their tireless effort as part of what Graeber (2013) elsewhere called 'the phenomenon of bullshit jobs'. Many regulators reported working 60 to 70 hour weeks regularly, foregoing vacations, and generally feeling as though they were living in their offices. This demonstrates Graeber's assertion that value, in any of its manifestations ranging from moral to the realm of exchange value, is articulated through action and thus is not merely an ideational category. Value is a material relation between people, institutions, and things.

It is one thing for high-level US administrators to declare that climate change is a national priority, but in California regulators have (re)created the moral value of the carbon financial product through their dedication to its definition, economic

valuation, and the constraints they have put on its circulation that complicates both definition and economic valuation through the challenges to realization. As the program manager said at a workshop about a substantial set of rule changes in light of California's linkage to Quebec's ETS, many of which dealt with restrictions on trading activities in the CCA, "You can't imagine what the last week looked like upstairs," referring to the late nights and weekends that staff were putting in to get the draft regulation ready to circulate (July 18, 2013, Sacramento). The constraints put on trading activities become necessary because of the parallax views of the CCA that are available to different actors. While the moral imperative of 'doing something' about climate change may make a useful corporate social responsibility story for 'green' investors, their subject position as financial capitalists makes exchange value their primary view of the CCA.

Many regulatory workers said they put in long hours not just because it was their job, but because failing to successfully tackle climate change was simply not an option. There was also a deep commitment to process I observed in both public workshops and in conversation with regulators. A program administrator told me that he often did not get to work on any text of the regulation or check in with his staff on their progress until well after normal working hours because the majority of his day was taken up with individually responding to the concerns of polluters subject to the regulation, community members, and requests for information from legislative staffers and other legislative functions, environmental NGOs, and members of the offsets industry (Regulator interview, March 1, 2014).

The endless process of interfacing with the regulated community, both in public through open workshops and in one-on-one 'offline' meetings has two primary causes. The first is California's rigorous open meeting laws that result in a relatively transparent regulatory process (though not without its faults, see Chapter 5 on how transparency can foster opacity, Ferguson 1990); the second bears more examination, as it relates to the conceptualization of the state in this process. As I have detailed elsewhere (See Chapter 4), regulators are deeply aware that they lack all the requisite facts and skills required to create an environmental-financial market, particularly in financial instruments that are so tenuously connected to the physical world of production and consumption.

Despite the many obligations that detracted from the amount of time that could be spent constructing the carbon market and the predictable ebbs and flows in organizational morale that accompanies any endeavor that lasts eight years, there seemed to be a sincere sense of purpose among regulatory staff and the broadly defined stakeholder community. This sense of purpose, which flowed from the sincerity of the ARB's politically appointed leader Mary Nichols, and indeed from the previous state executive, Arnold Schwarzenegger and its current executive, Jerry Brown, was largely oriented around the desire to "get it right" in market design, commodity definition, and achieving emissions reductions in diverse sectors through a variety of regulatory mechanisms. The notion of 'getting it right' is a central discourse to explain why regulators were willing to work 70 hour weeks despite the fact that they were fully aware that California's aggregate production emissions represent around one percent of the global total, and that their emissions

reductions strategy would amount to a small fraction of the total global emissions reductions necessary to prevent catastrophic global warming. However, because California had a long history of environmental leadership and the US federal government had failed to act on climate, it became a moral obligation for California to succeed where others had not. In other words, the creation of a commodity representing climate change gases was, from the start, imbued with a moral valence legible to regulators and environmental NGOs, but that might not have appeared quite so legibly to polluters, and was completely immaterial to the world of speculative finance. This immateriality is critical to understanding the second parallax under consideration, wherein the carbon commodity must function simultaneously as a factor of production and a speculative vehicle for accumulation and the spatio-temporal distortions the parallax engenders.

Carbon austerity

Alongside regulators' and politicians' continual statements about the importance of 'doing something about climate change,' another thing that was reiterated with impressive regularity was that California was not pursuing the commodification of climate pollution as a way to raise funds for the state, but for panoply of other reasons, ranging from economic efficiency to the distribution of equitable outcomes (See Chapter 5). That this sentiment bore repeating ad nauseam because the sale of CCAs through limited auctioning was forecast to generate revenues for the state between \$12 billion and \$45 billion between 2013 and 2020 by the California Legislative Analysis Office (Taylor 2014). This is not an insignificant sum of money for any entity, but particularly not for a state that is

constitutionally prohibited from running a budget deficit and that was suffering some of the most catastrophic impacts of the great recession during the period of rulemaking that would give rise to the cap-and-trade program. Further, the state spends roughly \$40 million per year implementing cap-and-trade (Taylor 2014). The notion that the point of marketizing carbon was not to raise funds also required reiteration because of the sheer volume of hearings, press, and other discourse surrounding it. While some design elements of the market, such as specialized workshops on the metrological systems for determining refinery compliance obligations, could attract as few as 8 people to a meeting in Sacramento, potential auction revenue spending plans resulted in packed auditoria, inboxes, and the submission of hundreds of comment forms. Two hearings held to discuss the use of auction revenue resulted in the submission of 197 written comments from parties ranging from regulated polluters to Silicon Valley Advocacy groups, to the US Navy, even though the discussion was completely non-binding since spending is ultimately the legislature's prerogative (ARB 2010, 2012). To that end, the legislature has passed not only the spending plan, but two major pieces of legislation (SB375 and SB535) that define criteria to guide how auction revenue is spent while steadfastly refusing to do any of the work of commodity definition or writing the rules of the market, even where the regulator has asked them to do so (for example, by setting new emissions reductions targets beyond the current 2020 horizon that would make carbon instruments indefinitely valuable) or where powerful polluting lobbies have sought to restrict the expansion of the commodity into new industries in the

case of creating compliance obligations for oil refineries in light of popular pressure not to do anything that would further increase the cost of gasoline in the state.

In 2009 and 2010, the years in which debates at the ARB raged around how best to distribute the financial instruments that represented the right to emit greenhouse gases, the state found itself in a budget emergency that required austerity tactics that would have been familiar in Southern Europe; budgets for health and education were slashed, critical infrastructure projects were postponed, municipal debt crises burst onto the national stage, and myriad social problems associated with these kinds of spending reductions were manifest. The budget crisis was exacerbated by two key restrictions on taxation; the first was that voters had imposed significant limits on the state's ability to raise property taxes (a primary funding mechanism) in 1980⁵ through Proposition 13, which dramatically limited the state's ability to raise revenues in step with rising costs and property values, and that all new taxes would require a supermajority in the legislature. The second was a court ruling by the state's supreme court, *Sinclair Paint v. State Board of Equalization* (1997), that revenue generated by required fees be spent by the state in pursuit of goals that narrowly pertained to the regulatory goal for which the fee or permit was designed in the first place. These restrictions are not immaterial, as they are central to discussion around the definition of the carbon commodity, including the language used by regulators in naming key facets of the program. For

⁵ Ironically, this ballot measure was passed during Jerry Brown's first term as governor, helping exacerbate the fiscal crisis in which the state found itself in Brown's second stay in the governor's office.

one thing, the greenhouse gas reduction program's revenues could not be called taxes, and the structure of the financial instrument and the institutions through which it circulates had to be differentiated enough from a taxation system so as to hold up under judicial scrutiny.

The vigorous ongoing discussion about how to collect and spend the revenues in a program that is not to be primarily revenue generating provides a useful window into the state. It points to the many different values that are in play in the conduct of the program, the parallaxes that must be bridged, and the challenges of doing that bridging. The strategic relational view of the state adopted by Robertson and Wainwright (2013) is well suited to the task of explaining how the California carbon market is, in effect, much more of a tax than a functional financial commodity that can be performed in electronic markets. As they note (2013, p. 10), "[This] approach leads us to appreciate the capitalist state not as a thing but as a social relation; not as a coherent agent unified around a simple project of expanding capital but as a stage on which struggles over capital accumulation play out. These struggles often play out around property law and institutions of market governance," such as the implementation of California's emissions law. While it is perfectly possible to demonstrate the porosity and relationality of the state through Jessop's (1990) theoretical insights, it is also possible to do so through a close engagement with the state (see Chapter 5 on the way the state moved to restrict key requests by polluters that would have made the offsets program more expansive). While the state actors involved in the market creation process move with a relative unity of purpose animated by the moral value of 'getting it right', there can be no

such coherence with the participation, and indeed recruitment, of actors and institutions who (at least professionally) would consider it morally valuable to indefinitely prevent the implementation of any greenhouse gas pricing policy, much less strict quotas and other direct regulations. In this way, the state is an explicitly capitalist one (even at the sub-national level) that must simultaneously account for the preservation and expansion of the value form while drawing on the other animating values as actions to which the exchange-form owes its existence (Robertson and Wainwright 2013).

Parallax 1: Creating allowance use value through meaningful difference

Having seen the moral and fiscal impetuses, as well as considered the state apparatus through which they play out to create a financial product that represented climate pollution, I turn toward the parallax views of the CCA. The first is the gap between the moral and semiotic valuation practices that are in play in the definition of the CCA's use-value. The following section will then consider the more established parallax of the CCA caught between its use-value and financialized exchange-value that, given the fluidity of both, requires regulatory intervention to fix as much as possible. In regulatory documents, the word value rarely appears in situations that could be understood as the definition of use value of the commodity in question (i.e. to fulfill regulatory obligation to account for one set of information with another set of information in the form of the carbon allowance or offset credit). The other mentions of value are heterogeneous and are reflective of the moral and semiotic valences in Graeber's tripartite division of valuation systems. However, much of the text of the regulation is devoted the creation of 'meaningful difference'

in the form of calculating individual compliance obligations out of reported and verified data.

The current version of California's cap-and-trade regulation defines the use-value of the CCA as, "a limited authorization to emit up to one metric ton in CO₂e of any greenhouse gas" (§95820(c)). While this statement appears fairly straightforward, there are myriad decisions that must be taken, discussions to be held, and approvals to be sought in order to determine what should *count* as one metric ton of CO₂e, and even more importantly, how it should be counted, who should do the counting, how that single ton of CO₂e is made fungible with other tons of CO₂e, and how those fungible tons of CO₂e sum to achieving the state's emissions reductions goal. The actions required of regulators and their policy interlocutors to make this statement intelligible and enforceable can be understood as the second of Graeber's categories of value under inquiry here: the semiotic, or the value of creating meaningful difference. That is, what sort of metrological regime is constructed that can create representations of intangible climate change gases such that they can be sold or given to polluters, who then can trade them at a specific price between themselves and speculators even while not containing full property rights, and ultimately surrendered to the state? Further, what sorts of limitations arise when the moral and semiotic confront one another within the regulatory process of definition?

While greenhouse gases are not the objects of management of the program (it is their informational representations), it is important to understand how they

are made to correspond to one another such that they can be made fungible while their definition remains open, which can fundamentally alter both the use and exchange value of the CCA. California decided to regulate the six 'Kyoto gases', the greenhouse gases that fall under the purview of the Kyoto Protocol, in addition to three fluoridated gases (F-gases) that are thousands of times more powerful in their potential to warm the atmosphere than CO₂⁶. The state adopted the relative power of each gas directly from the IPCC Assessment Report 3 (AR3). This exercise in alchemical equivalence has been unpacked thoroughly by MacKenzie (2009), but it bears noting that the number of reductions, simplifications, smoothing of difference between temporal warming potentials has serious ramifications in practice. It also bears noting that the AR3 definitions are over a decade old, and the chemical properties of each of these gases is now far better understood. For example, the relative warming potential of methane has increased from a global warming potential of 33 to one of 93 over a 20-year time line (IPCC 2013). Thus, companies who emit methane as part of their production process are theoretically 'under-charged' by 300%, or would be if it were their actual emissions that were the object of management; instead, it is representations of these emissions that are being managed in their informational format.

Given the imprecisions endogenous to any such undertaking and the difficulties and cost in directly measuring effluent output, it is simply not possible to

⁶ These F-gases are primarily found in refrigerants, their inclusion in the program makes possible the offset protocol for ozone depleting substances, among the most prolific (in tonnage and project numbers) for the market so far (Californiacarbon.info 2014).

directly manage these emissions (see especially Lippert 2013 on carbon accounting as an information management problem as opposed to an environmental one). Creating metrological regimes in a way that works as a reasonable approximation of emissions while being administratively feasible is a widely acknowledged challenge among rule-makers and their interlocutors. At a hearing on determining the best way to measure refinery emissions, the representative of the engineering firm tasked with coming up with quantification methods for both large and small refineries was asked why the firm's estimations of GHG emissions from a range of refineries looked so smooth if there were so many differences between feedstock and refinery processes. He responded, "we're getting into that trade off between accuracy and simplicity" (Sacramento, August 13, 2013). In the world of quantifying intangible gases, even the leading protagonists of measurement concede that the direct management of GHGs is administratively impossible and thus the state must find a workable compromise between precision and feasibility within political constraints.

A key part of defining the use-value (and by extent, exchange value) of the CCA was the determination of what aggregate levels of climate pollution in the state were historically and what the 'optimal' level of pollution was, or the setting of an emissions target by way of these emissions estimations. In support of this activity, AB32 included a provision for the creation of an emissions surveillance system, now called the Mandatory Reporting Rule (MRR), which required significant polluters (greater than 10,000 tCO₂e/year) to submit emissions data to ARB annually, and to provide best estimates of pollution back to 1990. The 2020 emissions target can

then be set, since it is legally tied to 1990 levels rather than being set in absolute tCO_{2e}. Even though these two numbers are ultimately supposed to be x:x equivalents, the content of 'x' is subject to redefinition were the metrological regime of quantification to be updated. The MRR also contributes to defining use-value in its proportional relationship to aggregate climate pollution from production; given that supply and demand⁷ are determined entirely through administrative fiat, part of the use-value of the CCA is the specific proportion of aggregate pollution that the title to a single CCA authorizes the holder to emit.

The use of the word 'value' in the cap and trade regulation is largely dominated by two of Graeber's categories and each come into being through specific regulatory actions- the first, obviously, is exchange value, the second the semiotic category of meaningful difference in the form of metric creation, standardization, and utilization. For example, "The [complexity weighted barrel] value for an individual refinery is calculated using actual refinery throughput to specified process units and emission factors for these process units," (California 2012, p. 13) In this bit of technical jargon, the regulator expresses that the represented carbon content of a refined barrel of liquid fuel will be determined through a series of calculations that include estimations of the averaged carbon content of the feedstock, the volume of material throughput, and the designated, averaged chemical processes that occur within each refining process unit. As such, it is not just a measurement, but a heuristic, or a representational estimate that results in a

⁷ Rendering each fairly inelastic.

definite number. This definite number, in turn, will be used to determine allowance surrender responsibilities of polluters. This surrender obligation is composed of a definite quantity to which a definite price can be assigned. As such, it is a numerical sign (value) that has a complicated relationship to what it signifies but does the semiotic work of creating difference insofar as a definite number simultaneously represents all numbers it *does not* represent. In this way, the material-semiotic definition of a value contributes to the definition of use value (and by extension, exchange value) by representing a specific proportion of the aggregate number of allowances that will be in circulation and as a representation of a specific entity's contribution to the cap, through which future free allocations are determined (through the reporting of specific emissions *values*). These values, in turn, account for the fact that the use value of the commodity is determined through fiat by way of another set of formulae that assign allocation based on previous years' calculated emissions.

While the exchange value meaning also works in terms of creating meaningful difference through the exclusion of other meanings, it works in a far more specific way. By way of example, “[t]he natural gas supplier shall calculate the value of these allowances based on the average market clearing price of the four Current Auctions held in the same budget year from which the allowances are allocated” (California 2012, 196). Here value is quite clearly defined as price, and the state is concerned with the ability of polluters (in this case, natural gas suppliers) to use the allowances they were given for free to accumulate exchange value; instead, as the regulation goes onto state, “Use of the value of any allowance

allocated to a natural gas supplier, other than for the benefit of retail ratepayers consistent with the goals of AB 32, is prohibited” (California 2012, 196). This prohibition on the unrestricted use of exchange values (for example, distributing dividends to shareholders or the expansion of facilities in a way that would increase emissions measurements commensurate to current production practices) neatly illustrates Felli’s claim that the use of carbon markets should be understood as a barrier to production rather than the real subsumption of the atmosphere. If the creation of the CCA facilitated the expansion of polluting activities within the state by way of using the exchange values captured through free allocation and subsequent sale to other polluters (as happened rampantly in the EU-ETS), then it could perhaps become a stable circuit of accumulation within the financialized economic geography of California. Instead, the prohibitions on trading activities and expenditures of allowances sale proceeds, coupled with the CCA’s mandatory surrenderability without compensation makes it more, rather than less, difficult to reproduce polluting industries by design. The pseudo-commodity works as a regulatory mechanism because of its surrenderability that muddies property rights in a way that allows for the state to capture value and exchange value from the polluting-productive activity.

The question of property rights in understanding the carbon allowance is of the utmost importance, particularly in understanding the function of the regulatory-capitalist state in situ and the way the definition of the CCA was made to take place. The fifth amendment of the US constitution includes a ‘takings clause’ which states that “...nor shall private property be taken for public use, without just

compensation." (US Constitution, Amendment V). Thus, the CCA must simultaneously be property and not-property. It must be property to the extent that it has clearly defined ownership such that a single CCA cannot have two holders simultaneously, that it can be transferable in a way that is consistent with contract law. However, it must not be property (at least not of the same class as a traditional financial instrument) because, ultimately, it must be surrendered to the state to compensate for a specific quantum of represented emissions (its use value) without exchange-value compensation (unless one is willing to conceive of the condition of not being fined for non-compliance as compensation).

The state cannot compensate for the surrendered permits, as this would undo the rentier nature of this marketization regime. If the state were to compensate polluters for the permits polluters are compelled to surrender, it would effectively evacuate the exchange value of a given allowance from the states' perspective and limit the circulation opportunity of the embodied exchange value within an even more compressed temporal window for the holder. The holder, in turn, could attempt to arbitrage between allocation and surrender events, thus extracting surplus value from other participants in the market. This situation would ultimately be zero-sum within the polluting community. Only savvy traders and the state could capture surplus value, and the compressed temporal window would potentially restrict liquidity. This restriction could reach a point where the price representation of the use value embodied in the CCA would automatically default to the state's baseline, or perhaps even just become unknowable because there would be no willing parties to contract a trade.

The regulation defines the compliance instrument's property status as, "Each compliance instrument issued by the Executive Officer represents a limited authorization to emit up to one metric ton in CO_{2e} of any greenhouse gas specified in section 95810, subject to all applicable limitations specified in this article. No provision of this article may be construed to limit the authority of the Executive Officer to terminate or limit such authorization to emit. *A compliance instrument issued by the Executive Officer does not constitute property or a property right.* (73, emphasis mine). And yet, the compliance instrument must still function as an exchange-value bearing instrument that can perform as private property for contractual purposes even though it will eventually be returned to the state.

In the period of negotiating the most fundamental properties of California's compliance instruments, it is possible to see how competing visions of the commodity-form played out by looking at public comments. From the outset the state was reticent to accord full property rights to any compliance instrument, be it in the form of allowances or offsets. For the state, the reason was primarily legal, based on what could have been interpreted as the state's seizure or destruction of exchange values. As the state's interlocutors on the empaneled Economic and Allocation Advisory Committee (EAAC) stated,

The EAAC advises the ARB to adopt policy instruments that can be substantially modified or eliminated The ARB should avoid policies that create property rights or other entitlements that cannot be changed should regional or federal policies be adopted (EAAC 2010).

In this example, the empaneled experts warn against full property rights because of California's scalar position relative to other levels of governance and the need for the state to remain flexible in light of new regulatory developments. In this

case, the danger arises from the passage of a US-federal level carbon market and its potential to supersede the regulatory authority of the ARB, which would, in turn, render compliance instruments without a use or exchange value, thus potentially constituting an unlawful taking of real property.

From the beginning of discussions on the property status of allowances, the state's environmental NGO allies were also reluctant to ascribe full property rights to allowances, but perhaps for different reasons. Environmental NGOs were concerned that defining compliance instruments as an inalienable property right would foreclose the state's ability to redefine the use value of a permit as might be required by changing environmental, economic, or technological conditions. As the Greenlining Institute (Marchant and Agular 2010) opined,

Vigilance must be paid to the impact on communities, business, and mitigation of carbon during the initial compliance period... Through review of the policies, modifications can be made, particularly if co-pollutants or other climate change adverse impacts are created and adversely experienced by low-income communities. Having opportunities for modification is valuable to both correct imbalances and effectiveness, in addition to adjusting to any new information or technologies that will likely develop.

To some extent, the need to redefine the use-value component of compliance instruments is beginning to arise in a most significant way, largely because, as discussed above, California chose to adopt IPCC AR3 definitions of global warming potential for the six gases that comprise CO₂e. AR5 definitions significantly increase the GWP of CH₄, California's second most abundant greenhouse gas. Any increase in CH₄ GWP would create a significantly higher regulatory compliance obligation on natural gas distributors.

Somewhat expectedly, counter arguments in favor of constituting compliance instruments with full property rights were made primarily by business interests and their industry associations. For example, the International Emissions Trading Association (IETA), the leading trade group for businesses involved in cap-and-trade markets around the world, stated, “IETA advocates a position that treats the percentage compliance allocation to each individual emitter as an individual tradable property right,” (2010). The IETA recognized the potential that unsurrendered offset credits could be stripped of their use-value as a compliance tool, which in turn could inhibit the creation or growth of the offset industry, one of IETA’s key constituencies, if the use-value of the compliance instrument was not locked in indefinitely through the establishment of property rights. Meanwhile, the Southern California Public Power Authority (SCPPA) made the case that,

[c]ompliance instruments should constitute property to provide greater levels of confidence in the new carbon market and to prevent the suspicion that the regulator may cancel compliance instruments without compensation to the holders of the instruments, (Peterson and Mitchell 2010).

Regulatory uncertainty was seen as inhibiting the development of derivatives markets, particular the forward/futures market, in turn (further) blunting liquidity resulting in ‘distortions’ in the price signal of the intended use-value (See Chapter 4). It makes sense that a power producer would see this issue to be of particular concern if we conceive of California’s regulatory carbon program as a barrier to production rather than the real subsumption of nature. If value primarily accrues to the state through rents extracted from the actual producers of value, then defining the commodity as a full property provides longer-term certainty, allowing

producers to engage in more sophisticated trading strategies that might allow them, in turn, to extract fictitious capital from other financial traders, in turn possibly making up some of rents extracted by the state⁸.

The fact that the tradable permits in question are not composed of the atmosphere, or privatized slices thereof, goes some way to understanding the relative amounts of time spent in public workshops and in offline conversations discussing the metrological, financial, and administrative features of the program, rather than the ecological impacts. Indeed, most of the metrological discussions that I observed were about who was assigned a given quantity of compliance obligations depending on where they were in the supply chain or in physical space based on the performance of algorithms, not physical monitoring equipment (which would have been burdensome and expensive). This is not an idealist argument that emissions are not real and are not quantifiable, merely that actual quantified emissions are not the material from which use-value is derived. The CCA is composed of information predicated on a specific metrological regime, which in turn is exceedingly difficult to calibrate. The CCA is made of reported emissions data that can vary as much as 5% from ARB's calculation methodology without penalty based on any number of standardized assumptions. These assumptions (each of which relies on previous metrological work) are about processes as complex and varied as the carbon density of electricity feedstocks to the length of transmission lines that move the power

⁸ Though this possibility was mooted through further regulatory action that significantly restricts the kinds of positions power generators can take in CCA in order to prevent profit-taking behaviors that were rampant in the EU-ETS and in light of the California electricity crisis.

around and through which some of that power is lost. In each of these quantification challenges, it becomes necessary to abstract more and more from the actual molecules that change the climate to allow them to become represented as actionable pieces of information (including the money form), actions that are predicated on the importance of 'doing something' rather than becoming paralyzed by the indeterminacy fomented by many levels of abstraction.

The parallax engendered through the dual moral and semiotic value regimes in the creation of a carbon commodity, then, is the epistemological gap between the desire to regulate greenhouse gases on the one hand, and the difficulties that arise in attempting to manage them directly which leads to the metrological feats required to manage them at all. Because of the intangibility of the objects of management, 'doing something' means management by proxy, which entails vast smoothings and simplifications of the complexities of California's polluting geography and the complexity of each of the chemical processes that comprises the emissions landscape as a whole. It is the uneasy settlement on the entire regime of quantification, ranging from total emissions within the state using historical data, to settling on two distinct ways of classifying process emissions from oil refineries that is coupled with the moral valance animating that semiotic/engineering practice that comprises the CCA's use value. This is a complication that must arise in an emissions trading system, and in all programs that hinge on the creation of abstract representations of environmental degradation, from payments for ecosystem services to exotic instruments like 'indigeniety credits,' though each will have its own metrological quirks to go along with locally specific moral imperatives. For

example, significant controversy erupted in the design of New Zealand's ETS around the quantification of livestock emissions from sheep herding and how best to incentivize its reduction when sheep comprise such a huge part of the country's aggregate emissions but are also a powerful symbol of the country's national identity (Cooper, Boston and Bright 2013). It is to the relationship between that unsettled use value and the more tangible exchange value to which we now turn.

Parallax 2: Factor of production or speculative opportunity?

The creation of financial products that represent intangible atmospheric gases is a highpoint in the career of financialization, which Knox-Hayes describes as,

the process of reducing value that is exchanged (whether tangible or intangible, future or present) into financial instruments.

Financialization is intended to accelerate the rate of profit accumulation from exchange of financial instruments. I conceptualize financialization as an extension of the conversion of use to exchange values in commodification (2013, 120).

This works well with Graeber's expanded notion of value, wherein the moral and semiotic actions of regulators and their interlocutors become embedded in the CCA, which is then presented as an exchange value divorced from the social conditions of its definition. The process is made all the more abstract because the object of management is information rather than some material quantum of carbon dioxide. Returning to Knox-Hayes,

[e]missions credits are not in practice different from other types of financial commodities. However, because they are commodities constructed from the absence of space and time, they represent the extreme end of spatial and temporal abstraction. In addition, carbon credits are particularly problematic because of the extent of the separation of between the complexity of carbon emissions and sequestration processes one hand, and the simplicity of financial

representation on the other (MacKenzie 2009), (Knox-Hayes 2013, 121).

This is particularly true of the carbon commodity if we interpret it not as primarily a means of accumulation but rather as a barrier to production through which the state accrues rents. In effect, the creation of a carbon financial instrument is a means through which the state can lay claim to past and future value creation through productive activities that result in emissions without attending to the specific temporarily or location of production that give rise to the production in the first place. As noted in a Californiacarbon.info webinar, if one is viewing the CCA from the side of the parallax that understands it as a factor of production, carbon is the only commodity that can be consumed before it has been produced. The commodity is later assigned to compensate for a particular ton of emissions bears no relation to the physical molecules for which the commodity supposedly represents, and thus the allowances are 'spoken for' within the production process before the state has issued the particular serial number or offset credit that is to compensate for the release of climate effluent. In this way, the exchange value of the CCA is perhaps the ultimate expression of fictitious capital⁹, or, "value created in exchange ahead of the production and realization of (surplus) value- a representation of value that comes to life before the value it represents," (Harvey 1982). The growth of fictitious capital as a component of the modern economic

⁹ Not to be confused with the Polanyian (1944) category of fictitious *commodities*, land, labor, and capital, which are the underlying components of capitalism that capitalism cannot produce for itself (See also Kappeler and Bigger 2011).

system, in turn, is one of primary causes and effects of financialization (Harvey 2003).

In a widely cited definition, Krippner defines financialization in general as, “a pattern of accumulation in which profits accrue primarily through financial channels rather than through trade and commodity production,” and as “the growing importance of finance as a source of profits in the economy,” (2005, 174) The difference between the first and second definition points to a problem and an opportunity for large industrial players in California’s carbon market. On the one hand, major polluters’ profits do still mainly accrue from actual productive activities, though the financialization of oil has become a significant revenue stream for oil majors (Labban 2011). The problem arises in the parallax nature of the carbon instrument as both factor of production (in which it is a barrier to accumulation when acting as a fee for pollution insofar as the carbon market serves to internalize the externality) and its second character as a vehicle of exchange value wherein savvy traders could either classically buy low and sell high, or more sophisticated traders can extract surplus value through the fabrication of derivatives products. As such, polluters such as oil companies must simultaneously treat the CCA as both a factor of production and a vehicle of exchange value, weighing the relative merits of each interpretation against one another. On the one hand CCA is a fee that must be paid to the state to compensate for emissions, but it is also another way to accrue surplus value through trading activities. Financiers and other market participants that have no productive stake in the CCA have no such dilemma and are free (within significant constraints, see chapter 4) to engage with

the CCA solely as a representation of exchange value in a market that has been characterized as 'the world's worst performing commodity' (Wynn and Chesney 2011).

In carbon, surplus value is realized in absence, either through the creation of an offset credit or in the surrender of a CCA from a regulated entity to the state, and that absence can only be ascertained through the complex epistemological feats through which climate change gases achieve equivalence, baseline emissions are created, and material throughput of production is surveilled, estimated, and emissions responsibilities assessed, in short, through its regulatory use-value. This use-value is then converted into a dollar-bearing exchange value that enters the circuits of financial capital until its exchange value flits out of existence when its use-value is exercised through surrender to the state. However, at this stage no exchange value is realized, as the transfer of value occurred at the initial sale of the CCA to the polluter through auction, and perhaps at other steps at which the CCA may have changed hands (at an arbitrated price). This makes sense, because as Labban (2011) notes,

Rather than eliminating the necessity of producing and realizing value in material production and exchange, financialization brought to the fore the antimony that Marx recognized between the conditions for the production of value and the conditions for its realization in exchange. For Marx, the exchange of commodities creates no value, but value can only be realized in exchange. This is what Karatani (2003) calls a 'pronounced parallax', the objectivity that is exposed through the displacement or incessant transposition between multiple representations of an object. Value on this reading is relational, not substantial; value, produced in the labor process, comes to existence in the relation among commodities in exchange.

Value, therefore, has its origin both in circulation and not in circulation (542).

One of the ways this pronounced parallax is mobilized in practice lies in the distinction between risk and uncertainty (c.f. Knight 1921), wherein risk becomes a quality of the CCA's exchange-centric view, while uncertainty is an aspect of its use-value, or its 'staying power' as a factor of production, and the attendant temporal disconnects each assumes. Regulatory uncertainty is the primary version of uncertainty that circulates alongside the CCA. This uncertainty arises because of the fiat nature of the CCA, wherein its use-value is potentially terminable at any given moment; this is expressed in both an implicit and explicit form. For example, since one of the key attributes of the use-value of the CCA discussed above is its relation to the aggregate number of allowances issued, any change in the composition of the relative weight given to each of the gases that comprise CO_{2e} could massively change the collective calculus about how best to utilize these scarce resources. Another way this manifests, and more pointedly, is the ever-present political threat that the legislature could move into the business of commodity definition. This potential has been mooted several times in the last year, as California congress members have floated bills that would have removed transportation fuels from under the cap either temporarily or indefinitely, impacting both the present and future use-value of the CCA as a factor of production.

This level of uncertainty poses distinct challenges for polluters who must account for financial representations of GHGs in their planning exercises both in terms of the money that must be set aside to purchase whatever quantity of

allowances their calculations project them to need for surrender and in terms of the types of contracts they write, plant expansions they might undertake, or offset projects they might pursue. From the perspective of the speculator, this uncertainty about the use-value of the CCA is a distinct concern, but it is a secondary concern to that of insufficient risk in the market as marked by changes in the exchange value that are potentially driven by this kind of use-value uncertainty. In short, if the future of the CCAs use-value is uncertain, then market liquidity will potentially dry up, rendering trading prices even less predictable, which is a less productive form of risk to the variety that traders prefer, wherein volatility is present but not overwhelming such that trades can be conducted with amazing swiftness as compared to the temporal logics that must play out in long-range industrial forecasting that takes carbon as a barrier to/condition of production.

Increasingly relaxed financial regulation has expanded the types of financial transactions and bets that are possible, and improved trading technology and economy-wide financialization has also contributed to the speed at which the transactions take place. Some firms claim to execute trades every 125 microseconds, and more than 55% of trades on the NYSE in 2009 were made by high-speed trading robots (Duhigg 2009). Arbitrage strategies, high frequency trading, and the sheer volume of financial assets that change hands on a daily basis point to a fundamental shift in temporal logics at play for finance capitalists, and even for companies whose primary business lies elsewhere. As Randalls (2010) and Pryke (2007) demonstrate, many firms that operate in the world of material production play financial markets in order to hedge against conditions in the 'real economy.' For example, electric

power companies engage in conditional and repurchase agreements, swaps, and other strategies in the financial markets to protect against losses that could result from unanticipated changes in demand. This sort of split-second extraction of surplus value has a dramatically different temporal rhythm than the production of surplus value through polluting activities, much less the global atmospheric processes that inform the moral importance of creating the financial representation of carbon in the first place.

The second parallax between the already fraught use-value and its freewheeling exchange value counterpart is ultimately the reason why non-state actors do not realize value in the circulation of CCAs. In contrast to conventional commodities that are subject to the familiar rhythm of M-C-M' where money is invested in the production of commodities that are then sold for more money, the CCA is unbound from time and space from the moment it enters the world as a freshly minted serial number. As we have seen above, that particular serial number may have already, in effect, been consumed, its use-value for the purchaser satisfied in the day-to-day production of real commodities. Exchange values flow to the state from polluters who are compelled to purchase CCAs or in arbitrated trades between market participants, but only at the point of consumption rather than production. The beginning point is effectively the end point. For polluters, the CCA generally does not make the *salto mortale* of value realization. This parallax manifests itself in both the function and governance of the CCA, as its untethered qualities would seem to make it the perfect vehicle for speculation if its conditions of production were less intangible, its regulatory basis perceived as potentially unstable by speculators, and

the state had not moved to put so many checks on its performance. These checks (see Chapter 4) fix its use and exchange-value to a great extent, but still nowhere approaching the level of fixity achieved in traditional commodities, or even traditional financial products that are abstracted but still bear some resemblance to their conditions of production and more 'intrinsic' use value.

Wither value in regulatory carbon markets?

Having now decentered the ontological stability of the CCA through exploring two key parallaxes through which it is composed, I turn toward the overriding question - namely, does the creation of a commodity-form composed of carbon representations that functions simultaneously as pure fictitious commodity and factor of production actually signal the real subsumption of nature? Smith (2007) describes a future well underway wherein nature becomes a condition of the reproduction of capital through two distinct mechanisms. The first is the more material production of socio-natures through interventions like OncoMouse™, where nature is quite literally re-worked to produce value. The second is more in line with the types of activities this paper has dealt with, the financialization of environmental degradation (Smith, 2007). However, it is difficult to ascertain the extent to which these kinds of interventions are having a substantial impact on how capital is accumulated by polluters or speculators in these markets, except through the defrauding of individual investors (City of London Police, 2014) or defrauding tax authorities (Funk, 2015). From these observations, we can then ascertain the role that CCAs and their like play in the real subsumption of nature by capital. Subsumption is a systemic category that accounts for difference across ontological

status and subjectivity- witness the difference between the formal and real subsumption of labor (Marx 1967). However given that the privatization of the atmosphere only entails the extraction of rents from other, actually occurring materially-productive activities rather than the actual creation of value, it can not represent real subsumption despite its appearance as such- it is merely formal.

While I remain open to the possibility that value is produced through material interventions into the environment in projects like mangrove restoration or wetlands mitigation projects, and it clearly is in the case of bioengineering and the like, the California carbon allowance requires no such material intervention. Instead, in this case, the work of the state is mobilizing non-economic values and producing exchange values, and thus creating a barrier to production by extracting rents on virtual space, spaces that the state is able to create through its role as arbiter of property relations. Felli (2014) puts it bluntly when he argues that, “Emissions rights do have an exchange value and a use value, but they do not represent value” (268), and that, “the ownership of the access to a condition of production allows its owner to ‘obstruct’ the process of accumulation and derive an income from it” (270). The result of non-economic (that is, moral and semiotic) values-as-actions by the state create the situation in which value can be realized, but does not, in itself, produce value. Rather, the state captures rents that are composed of the congealed labor-nature processes that result in the production of commodities, though without regard to the exact time and place of that production.

Rent is a social relation of property, in this case the spatial delimitation is the public appropriation of an imagined atmospheric commons. The extent of this commons is not determined through some absolute biophysical space of the atmosphere around California, but as an emergent property defined through regulatory fiat. Regulators achieve this tenuous level of stability through the translation of climate science and sundry other knowledge regimes that allows 'the atmosphere' in question to be defined as the 'out there' into which California's regulator-defined carbon budget may be emitted. Emissions are only legible in this framework through a defined set of polluting activities conducted by a specific class of polluters, over which the state has assigned itself exclusive rights to partition in the form of a tax.

Robertson and Wainwright (2013) discuss the dialectical process of value creation, demonstrating that Marx does not have a labor theory of value per se; indeed, Marx was writing against the fetishization of labor as the wellspring of value in Ricardo and Smith (p. 6). Rather, the creation of value is a process that occurs when labor and nature confront one another in the production of commodities. This is telling, because as I have demonstrated, the creation of a carbon allowance is not an encounter between labor and nature; it is an informational process of definition that has more in common with a mortgage backed security than with a bushel of wheat, or, one could argue, even a wetlands mitigation project of the kind that Robertson and Wainwright discuss, insofar as the carbon commodity-form, even when functioning properly (to say nothing of fraud like has occurred in the EU-ETS or RIN markets) never necessarily entails the application of human labor to non-

human nature. This is not to say, of course, that the *appearance* of privatized slices of the atmosphere is not discursively productive, engenders new (neoliberalized) subjectivities, or does not have policy ramifications. Rather, it means that it is conceptually inaccurate to understand the circulation of surplus capital in the form of exchange value through financial instruments that purport to represent the absence of one ton of carbon emissions that the ultimate expression of the *actual circulation of capital in the atmosphere*.

Conclusion

Let me close by briefly reflecting on the political ramifications of this argument, because it seems to me that there is a way to read this as tacitly accepting cap-and-trade as a useful regulatory strategy for mitigating climate change¹⁰. It does, however, reinterpret cap-and-trade as a fee levied through rents by the space-making practices of the state rather than a market or an accumulation strategy for polluting industries, and taxes are indeed a barrier to the private accumulation of capital. This is a good thing if we're concerned with getting a handle on climate pollution. To return to Felli (2014) on the importance of the state as a locus of emissions reductions created through barriers to production,

¹⁰ Thanks to Jessica Dempsey for making this point to me.

by avoiding the idea that emissions allowances are commodities, it points to the fact that climate governance is not the expression of a one-dimensional advance of capital but is rather a process characterized by internal contractions and barriers to capital's accumulation. As a consequence, one need not posit subjects that are external to the capitalist relations of production as the main social force capable of reorienting social production toward more sustainable goals (254-5).

So even if we can never directly know the extent of CO₂e emissions in a given jurisdiction, we could put a robust carbon price in effect through taxation. Obviously any exchange-value denominated fee to pollute will have its metrological and potentially ethical, problems, but as a political strategy, we should not unilaterally concede pricing mechanisms to the neoliberals. That said, it may be unlikely that any state that must concern itself with reproducing the value-form will be pursuing the punitive level of taxation required to deal with the climate crisis any time soon. After all, as Graeber notes, "The ultimate stakes of politics... is not even the struggle to appropriate value; it is the struggle to establish what value *is*." This jives quite nicely with Jameson's (2006) reading of Žižek's parallax, wherein 'the economic' can never be accessed directly through the political. So by expanding the study of values that are reproduced and circulate in carbon markets beyond the value form (but not excluding it) while fuzzing the ontological stability of the commodity itself through the identification of the multiple parallaxes at play in the creation and performance of that financial product, geographers can make a contribution to the struggle of establishing what value is, and how is it best made actionable through the political, where supposed carbon pricing regimes actually reside rather than in the circulation of surplus value through the atmosphere.

Chapter 4: Sequestering Carbon: The limits to marketization¹¹

California's Assembly Bill 32 (AB32), The Global Warming Solutions Act of 2006, is the most comprehensive climate law in the United States. It seeks to return California to 1990 levels of greenhouse gas emissions by 2020 and has spawned 18 distinct mitigation programs ranging from quotas for renewable power generation for electric power utilities to a program for recycling automobile refrigerant. The most significant of the measures is the creation of a cap and trade market designed to put a price on greenhouse gas emissions by making emissions a tradable commodity in the form of carbon allowances.

This chapter is concerned with how the marketization of carbon credits is conducted by specific people constitutive of institutional arrangements rather than "arising from the human propensity to truck, barter, and exchange" (Smith 1776). The naturalization of Smith's formulation of the origin of markets is, at least rhetorically, regarded as an article of faith among the exponents of contemporary neo-classical economic theory that informs efforts to achieve environmental goals through markets (Mirowski, 1989; Arrighi 2006). Writing against purely instrumental accounts of carbon markets that reduce market formation to a series of design criteria (c.f. Tienenberg 2006), this chapter elucidates the assembly of carbon markets by exploring the affinities and tensions that arise when regulators,

¹¹ This chapter is currently under review at Geoforum under the title Rules of the 'market': Enrolling and sequestering finance in environmental governance.

financiers, and heavy industry confront one another on the terrain of market policy and operations. I show how, in Callon's (2009, 1998a) terms, environmental marketization is framed through iterative engagements between *in vitro* and *in vivo* experimentation, and the ways in which regulators preemptively move to check the practices of finance that they fear will overflow this framing in the form of market failures. In doing so, regulators substantially impede practices that are necessary to regard the institutional entanglements California has created as a market as such, but rather as an administrative carbon price in its current incarnation.

In the analysis below, I will examine potential and actually occurring market failures that are generative of market rules. For Callon, “[t]he term market failure ’ does not mean that nothing good was produced... in terms of the provision of socially desirable goods, the best result that could have been obtained was not achieved in practice” (1998b, 247). In California's carbon market, these suboptimal outcomes, both existing and potential, arise not only because of political-economic contradictions inherent within state-backed environmental credit markets (see especially Lohmann 2011), but also because of the social conditions of marketization. In this case, regulators tasked with the creation of a carbon market seek to balance their desire for a smoothly functioning financial market with their trepidation regarding the demonstrated excesses of financiers in unconstrained markets (Descheneau and Paterson 2011).

I argue that the practices of marketization will always overflow their framing in environmental credit markets and that regulators have, by design, moved to

preemptively check those overflows, seeking to “civilize” (Callon 2009) financial practice by restricting what the state would interpret as aberrant performance of the market (c.f. Butler 1990). While this engenders frustration on the part of financiers who would like to speculate in a more 'pure' market, regulators are generally comfortable disrupting the putative self-regulatory capacity of markets. As one high-level regulator told me, “I hate it when the press writes [our] carbon up like it's any other commodity. We didn't make a market for the sake of having a market, we're solving climate change!” (Sacramento, October 2013). While the degree to which this market is “solving” climate change is debatable (Roberts 2014), the market's deviance from those of other kinds of markets is not.

The reticence on the part of regulators to enroll finance in environmental policy despite its centrality to the operation of other markets follows from California's recent experiences with deregulated financial products, especially the California electricity crisis fomented by deregulation of the power sector. Experience with financialized markets in somewhat intangible goods that led to market disruption, which in turn wrought havoc on the 'real' economy has led regulators to constrain the performance of markets, confirms' Callon's characterization of carbon market formation as a dialogic process of between economic modeling and policy experimentation; however the California case contradicts Callon's (2009) implicit argument that the outcome of these experiments will be a *de facto* market because of a number of state and capital entanglements that resist framing, leading to severe limitations on the deployment of calculative logics that are the hallmark of actually existing financial markets.

The chapter begins in section I with an explanation of the impetus behind the creation of carbon markets, and the people responsible for their implementation in California, the Air Resources Board (ARB). Once the policy and regulatory stage is set, section II considers the roles financial capital is thought to play in environmental markets. Financiers are enrolled to fulfill demands of the market that the state can or will not; the paper specifically describes three key potential market failures that financiers are thought capable of rectifying. These desirable qualities of financial capital are then problematized in Section III, as regulators' anxieties become formalized in market rules that constrain the unfettered performance of financial capital. The paper concludes by briefly reflecting on the ramifications of assembling markets in such a way that prevents them from functioning as markets. The ongoing process of framing and overflows, preemptively checked and post-hoc corrected, make for a twist on the Polanyian maxim that, "laissez faire was planned, planning was not"; – in this case laissez faire was planned, but planning was too, (Polanyi 1944, p. 147).

Market conditions

The marketization of greenhouse gases in California is the result of tireless effort from regulators with input from an array of stakeholders including the polluting industries, environmental NGOs, consulting engineers, academic economists, lawyers, business lobbying groups, and financiers. The desire to create a carbon market that can produce representations of the price of physical reductions of greenhouse gas emissions through the creation of a financial market springs from the elegant models that seem to demonstrate the possibility of markets that will

allow California to green its economy. These models have been deployed widely, as markets have achieved tenuously hegemonic status as the dominant response to climate change, despite the repeated failures of market governance to cope with localized climate pollution, much less global climate change (Bailey, Gouldson, and Newell 2011). As of 2014 markets have been created in 46 jurisdictions representing 12% of global GHG emissions, and markets are under consideration in policy and environmental settings ranging from Chile to China and at international summits (IETA 2014). Market boosters, such as the International Emissions Trading Association (IETA), are pressing for the creation of regional, national, and subnational environmental markets across the world as the last-best hope for achieving a global carbon price in light of failures to negotiate a binding global climate treaty (Forrister 2014).

Heeding Blok's call (2010) to contend with the political and legal entanglements of market framing and overflows rather than their purely economic logics, it is important to hone in on engagements among actors who have potentially divergent goals in order to better understand existing and potential environmental governance. The marketization of the atmosphere in California, which can be seen as one of the heartlands of both climate pollution and market-based environmental policy (Stavins 1998), stands in contrast to the work of Blok and many others, who have focused on the creation of carbon markets in the Global South or on the neo-colonial ramifications of North-South marketization (Davis 2008, Bumpus and Liverman 2009). In some ways it is rather surprising that many treatments of carbon markets focus purely on the role of economic thought in the

construction of carbon markets, given that one of the earliest treatises on pollution markets, Dale's 1968(a), *Pollution, Property, and Prices*, was subtitled, "An essay in *policy-making* and economics," (emphasis mine). By delving into the technocratic processes of marketization, we can see the actual regulatory and economic practices that have occurred in California and their resulting institutional forms. These practices, in turn, are a key constituent process in larger trends in financialization¹² (Bakker 2004).

The specific conditions in which carbon was marketized in California follow the recall of Governor Gray Davis in 2003 and election of Arnold Schwarzenegger, who staked his political legacy to reducing California's climate footprint (Davenport 2012). While AB32 did not necessarily require the implementation of a carbon market to achieve its emissions targets, it did allow for it. The European Union Emissions Trading System (EU-ETS) had launched in 2005 and seemed to be functioning well, giving supporters of the market grounds on which to argue for a similar system to be deployed in California. California also had a history of using

¹² Financialization is the process by which an increasing share of global economic activity occurs in the sphere of speculation rather than that of production. Along with deregulation, it is one of the key features of neoliberalism (Mann 2013) In the United States, the shares of GDP produced through manufacturing and finance have become inverted. One of the key ways this has occurred is through the proliferation of exotic financial products like carbon credits. See also Knox-Hayes (2013) for a definition of financialization explicitly in the context of carbon markets.

markets for environmental ends, having experimented with a market in nitrogen and sulfur dioxides emissions for power plants starting in 1994¹³.

AB32, only 13 pages long¹⁴, has allowed significant discretion in implementation, giving regulators wide latitude in framing the ‘hot’ political, techno-scientific, and economic factors of California’s emissions landscape (Callon 1998b). This discretion is key to understanding the negotiation of market rules, how the market is framed, and controversies over what is to count as overflowing the objectives of regulators. California initially conceived of its market as the cornerstone of an emissions trading system that would cover industrial and transportation emissions across the western United States. The alliance, the Western Climate Initiative, subsequently fell apart following the ascendancy of Republican legislatures in 2010 elections, leaving California to press on with regulating polluters even as its neighbors did not.

The task of implementing the Global Warming Solutions Act fell to the California Air Resource Board (ARB), a sub-agency of California EPA. ARB is a sprawling institution with broad powers and a track record of instituting relatively tough environmental policies. However, ARB is primarily a public health agency, and

¹³ The success of this market remains contested. The US Environmental Protection Agency issued a damning report concluding that marketization of these emissions lead to much slower abatement than might have been achieved using traditional technology and performance standards, and the existence of this market significantly exacerbated the 2000-2001 California electricity crisis (USEPA 2008).

¹⁴ By contrast, the Waxman-Markey federal climate bill that failed in 2009 totaled 1428 pages and contained almost every design aspect possible.

so they depend heavily on the work of economists, think tanks, and the information provided by market oriented NGOs and other stakeholders to guide rule making. Economists are enrolled through a number of mechanisms; some, like Robert Stavins at Harvard, participate as a result of their research programs, while others are contracted by ARB to produce analyses used to develop market rules. Topics on which these contracted economists comment include how to distribute allowances to emit greenhouse gases, how allowance auctions are conducted, and how the limits to the number of allowances any single entity may own are established; in other words, key precursors for the performance of markets. However, as section III elaborates, economists have been enrolled not only to enable marketization, but also to place restrictions on the same markets they are helping to create.

Once California decided to pursue market-based climate policy, it set a goal for emissions reductions and determined periodic, falling limits on aggregate emissions. This is the 'cap' in cap and trade. The Air Resource Board also had to decide which polluters to target for emissions reductions. In California, all facilities with greater than 25,000 tons of CO₂ emissions per year must participate in the program¹⁵. The regulation covers around 600 installations representing 85 percent of California's emissions (ARB 2012a). Capped industries include those that are readily thought of as polluters, such as electric power generation and oil refining, along with other industries that many not come to mind as readily, like food processors, cement manufacturers, and state universities. The disparity in the size of

¹⁵ Facilities with lower emissions are also allowed to opt-in to the program. See chapter 2.

polluters covered by the regulation, both in terms of the GHG output and economic clout has had significant ramifications for market design and operation. For example, Chevron, with annual emissions of more than 35,000,000 tons of carbon emissions per year is covered by the same regulation as a winery with annual emissions just over 30,000 tons (ARB 2012b). The capacity of these polluters, one massive, the other just barely over the compliance threshold, to influence the development of the regulations in which they must operate differs markedly.

Size disparities also come into play when understanding the relative power of polluters and financiers vis-a-vis one another, and in relation to the regulator, as smaller polluters will have significantly fewer resources to influence market operation through calculated trading activities. While this paper, because of space constraints, cannot deal with commodification of greenhouse gases as a separate step in the financialization of the atmosphere (Bakker 2005, Castree 2003, Knox-Hayes 2013) it is important to note that the emissions from across economic sectors and polluting activities must be treated as entirely fungible. This fungibility must remain enframed no matter the size of the emitter or the proximity of the emitter to vulnerable communities in order for financial representations of carbon to function as a tradable product, which has significant environmental and spatial justice ramifications (See Chapter 5).

After the cap is set and the regulated parties are defined, the trading aspect comes into play. Individual emitters are required to turn over allowances commensurate with their reported pollution to the Air Resources Board. Each allowance represents one ton of emissions, or more accurately, their absence

(MacKenzie 2009, Knox-Hayes 2013). These credits come into being primarily through fiat, or government dictate, and are distributed in California through a combination of free allocation to polluters and the conduct of an auction by ARB. Facilities that release less than their allocated emissions can sell (trade) their excess permits to facilities that have exceeded their emission budget. According to economic theory following Coase (1960) and Dales (1968a,b), facilities that can reduce their emissions relatively cheaply will do so and then sell their excess allowances to facilities where the costs are higher to reduce emissions. This, in turn, will provide financial incentive to reduce emissions. Allowances can be traded through bilateral contracts or on an exchange. Speculative participation in secondary markets or in the auctions conducted by the regulator is allowed, but with substantial restrictions. Following sections of this chapter show that the participation of speculative capital is both sought after and regarded with wariness by regulators and some compliance entities.

The seductive qualities financial actors bring to the market are generally oriented around notions of adequate liquidity, the condition that plenty of money is circulating through the market. But it is the very possibility of other practices that arise alongside liquidity, like market manipulation, that requires restrictions on the market. Regulators have moved to capture potentially detrimental overflows in a number of ways. The number of carbon credits that any individual entity can own is limited by holding limits in order to prevent any company or trader from cornering the market. Regulators have also written price controls into the rules of the market. These price controls stand starkly in contrast to the unfettered operation of markets.

In terms of neo-classical economic theory, the price of a carbon credit should be determined through a supply and demand relationship, no matter how high or low. When regulated polluters buy their carbon credits from the regulator at one of the quarterly auctions, there is a price floor at which regulators will not sell permits below; this floor started at ten dollars a ton at the first auction in November, 2012, and escalates annually by 5% plus inflation. There is also a soft price cap at fifty dollars a ton¹⁶, though this threshold has never been approached in practice. Regulators seek to balance the needs of having a carbon price that is sufficiently high to act as a credible ratchet by which to lower physical greenhouse gas emissions with the dangers of a high carbon price. These dangers will be discussed below.

ARB takes pride in being on the cutting edge of environmental policy, and one of the discourses that gives traction to cap-and-trade implementation is that failing to do so would comprise California's leadership role in prompting widespread climate mitigation (Brown and Mecklin 2014). The perceived importance of leadership has only escalated in recent years after the collapse of the Western Climate Initiative. While California would have been the largest regulated jurisdiction in this alliance, putting a price on carbon when neighboring states do not has ramifications for both market design and function. Regulated industries argue that California has made itself vulnerable to jurisdictions that benefit without associated costs because Californians are paying for emissions reductions while the

¹⁶ While it is not explicitly a price cap, if the demand for allowances outstrips availability ARB can hold a second auction in one quarter that releases allowances at \$50/ton.

environmental benefits accrue globally. These complaints are given teeth by a provision in AB32 that climate regulation must not engender 'leakage', a spatial overflow that occurs when emitters move outside of California's jurisdiction to avoid the costs of regulation and take not only their pollution, but also jobs and tax revenue with them (cf. Kama 2014 on leakage in the EU carbon market).

Another fear associated with regulating climate pollution when others are not is that by reducing the pool of regulated entities and the total emissions available to trade would result in higher per unit emissions reduction costs¹⁷. Boosting liquidity and thus alleviating potential capital shortages for emissions reductions is one of several ameliorative roles that finance capital is envisioned to play in California's carbon market.

Building a market fit for speculation

Financial actors are a key group of stakeholders in the creation of California's carbon market' (cf. Johnson's 'Risk Industry' 2010, and see Knox-Hayes 2009). Financiers are part of the group of perhaps 700 regulators and regulatory interlocutors who have muddled through market definition and framing together over the last eight years, building relationships through late nights, tight deadlines, and endless workshops. The community that has arisen in the formation of the market can make for strange bedfellows- it is common to see representatives from

¹⁷ Rising prices is a contentious matter among regulators and environmental advocacy groups. While many regulators prefer a low carbon price, many in the environmental justice community and their allies would prefer a much higher carbon price. See Chapter 5 for a discussion on how the regulation was written with a preference for low prices.

oil companies socializing with environmental lobbyists, asking after each other's families or arguing about where to have lunch during workshops at California EPA headquarters. Financial actors were involved in the development of the market from before AB32 was passed and have ensured themselves wide-ranging roles in market operation. I take a fairly expansive definition of financial actors. It is not only more or less pure financiers who play the market, but also regulated polluters who also have significant liquid capital that can be used to achieve particular market outcomes through trading activities, or performances of the market that allow it to continually reemerge (Knox-Hayes 2009). Indeed, one of the desired outcomes of marketizing environmental governance is that all parties who are compelled to participate through regulation are hailed as financial actors subject to the disciplines and rewards of the market, and by extension their customers will be as well (Costantino, quote in Kasler 2014).

There are three key roles that financiers and financial capital are thought to fill if the carbon market is to work as envisioned. First, financial actors are contracted to provide market infrastructure; second, they provide expertise to fill gaps in regulatory know-how. The advisory role is provided by both academic economists and professional financiers, and is critical to how debates around marketization take place, profoundly influencing key market design choices. Economists in particular have wielded significant influence in market creation, having weighed in on many aspects of market architecture and rules. These economists have opined on topics ranging from the desirability of a marketization in the first place, to programmatic minutiae about auction methodologies. This

illustrates MacKenzie's (2006) assertion that “economists make markets,” but these economists also require a heterogeneous network that most importantly includes the state but enrolls diverse actors into market formation as well. The third reason that financial actors are enrolled in marketization is that their trading activity is supposed to prevent market failures. The section concludes by examining three key market failures that financiers are enrolled to mitigate through their participation in the market.

The most straightforward of the three roles of financial actors is the need to provide the technical systems in the form of infrastructure through which market transactions can take place. About half of the emissions permits are distributed for free to regulated entities (in theory to prevent leakage) and the remainder are auctioned quarterly. Auction design and mechanics were a hotly debated issue (EAAC 2010 and Public Comments), but the auction platform itself was contracted to MarkIt, whose primary business is derivatives analytics. Deutsche Bank¹⁸ is the services provider for the auctions in a number of capacities, including the confirmation of bid guarantees¹⁹ and ensuring that payments clear. These contracts with Deutsche Bank and MarkIt are two of eight contracts that ARB has issued in support of building its carbon market, reflecting gaps in public sector expertise and

¹⁸ Deutsche Bank is the subject of an ongoing EU-wide investigation for using EU carbon credits as a tax avoidance scheme and are facing fines of over €60 million (Wilson 2012). DB had won the contract for market services with the ARB before these charges were leveled.

¹⁹ Prior to bidding in an ARB auction, participants must be vetted and then post bid guarantees. Bidders may not purchase allowances valued at more than the guarantee they have posted. Some financial analysts claim this had dampened speculative participation in auctions (CaliforniaCarbon.info 2014).

capacities. Five of the eight contracts were made to either academics with explicit expertise in market design and regulation (economics), or to financial service providers who could assist with the material practices of marketization (the economy) (c.f. Callon 1998b).

Once distributed, allowances can be traded on the Intercontinental Exchange (ICE) in Chicago or through bilateral contracts. Futures can be bought and sold like other derivatives product traded on the ICE; however trades that result in physical delivery must be reported to the ARB because the holding limits on the number of allowances particular parties can hold (§95921)²⁰. In this situation both buyer and seller must be registered with the ARB, have sufficient room under their holding limits and the trades must be confirmed by both parties within three days or the trade will be invalidated and the trading parties penalized (§95920)(a-g).

ICE developed the physical infrastructure for carbon trading when it hosted the now-defunct Chicago Climate Exchange, a market for voluntary emissions reductions that folded in 2010 with the failure of US federal climate legislation (Gronewald 2011). Monitoring Analytics LLC monitors trades that occur on the ICE and on the auction platform. While ARB assures market participants they monitor the market for malfeasance, third party monitoring is thought to enhance trading integrity. However, this partnership gives critics of market mechanisms (or regulated entities who simply do not want regulation) ground on which to raise

²⁰ All § refer to the relevant portion of the cap and trade regulation in the California Health and Safety Code (California 2012).

concern; after all they argue, if additional market monitoring is needed, does this not point to excessive risk for regulated parties and for the economy in general?

Each of these infrastructure providers largely abstains from public comment on the construction of the market. Instead ARB, in consultation with myriad stakeholders, specifies design criteria. This consultation is the second role of financial interlocutors; however it is not solely the purview of actual financiers to weigh in on the rules of the market (Mackenzie, 2009, Lohmann 2013, Callon 2009). ARB often contracts a group of academic economists to educate ARB staff on the relevant economic theory for each issue and make a set of recommendations that will frame debates between stakeholders that ultimately result in the way rules of the market are written. This contractual relationship signals the degree to which marketization is a highly technocratic process, even as the regulatory process remains largely transparent in the sense that most proceedings and draft documents are publicly available, though this isn't of much use if one does not have the expertise to interpret these texts (See Chapter 5, and Mitchell 1999, Swyngedouw 2010). Most of these economists have some background in studying and modeling electricity markets, which is useful for at least two reasons. First, electricity production comprises about a third of all regulated emissions in the market and is an area where the public may notice impacts of regulation. Second, the 2000-2001 California electricity crisis is the most common point of reference for the potential pitfalls of market creation.

In 1998, California deregulated its electric power sector, allowing traders to speculate on price movements in the wholesale power market. In this strange

market (Harvey 2010), traders widely manipulated prices. These strategies, in concert with other infrastructural and environmental factors, resulted in rolling blackouts, price spikes for consumers, deaths from heat exposure, and, for a while, windfall profits for companies like Enron (Barbosa 2002). Ultimately, the power industry was partially re-regulated and the California Public Utilities Commission and the California Electricity Commission were given more oversight. These other regulatory bodies use their authorities to further regulate power participants in cap-and-trade to prevent the costs of cap and trade from being passed on to consumers (§95892).

The carbon market and electricity market share a number of similarities, especially the intricate connections to markets in more tangible products ranging from construction materials to food processing. Regulators are keen to avoid a repeat of the electricity crisis, which would undoubtedly undermine the popular and political support climate change regulation currently enjoys. This possibility of a new electricity crisis been raised not only by electric utilities who might have preferred to defer their participation in the market, but by the Federal Electricity Regulatory Commission (FERC), which urged the Air Resources Board to suspend key elements of market regulation in the fear that enforcement of those rules would endanger the stability of the electricity grid. In an August 6, 2012 letter FERC commissioner Phillip Moehler wrote,

I am... extremely concerned about the potential disruption to California's electricity market that may arise from the ... implementation of California's greenhouse gas trading plan. Such market disruption would not only seriously impact California's economy, but as the 2000-2001 energy crisis showed, such a disruption would also have major negative impacts on the economy of the West.

Regardless of any laudable intentions the ARB has in developing its approach to these issues, the potential ramifications to the economies of California and the Western states require extreme caution to prevent market and supply disruptions. Well-functioning markets require certainty, and the uncertainty created by ARB's approach must be rectified...

In order to constrain the eminently rational, but likely detrimental actions of electricity importers and utilities subject to punitive action if they ran afoul of supposedly unclear rules, ARB ultimately relaxed the restrictions to which the letter above refers. The results of this intervention will be presented in more detail below, but this example highlights the ways in which the rationalities of capital and the desires to constrain it to achieve beneficent environmental goals through marketization conflict. The trepidation of the federal regulator, whose primary objective is to secure a stable power grid that enables both economic production and social reproduction, neatly expresses the complicated entanglement between 'real' and 'fictitious' capital (Roberts 1994) at play in electricity and carbon markets, as capital circulating within each of them become indistinguishable regardless if the money is ultimately injected for speculative or 'productive' reasons, which in turn are reflected in firms' locational decisions and emissions strategies. It is the government itself that must preemptively capture overflows arising from these irresolvable entanglements owing to the universal fungibility of currency if it is to

maintain its accomplishments of enframing as far as a relatively stable market is concerned.

Creating market rules that walk the tightrope of these complexities is a task that has often fallen to the contracted economists. These economists, in teasing through the impacts of constitutive financialized 'real' and fiat markets on carbon market function narrowly, and on the state's economy as a whole, have enormous clout in shaping the epistemic framework of marketization. Their analyses are most commented-upon documents of the market design process and the focus put on the economists' work serves to make neoclassical economics the lingua franca of California's climate change policy. In regulatory workshops it is not uncommon for environmental policy matters to be discussed in language that would be familiar in an economics seminar while environmental concerns are rhetorically subordinated as secondary concerns (see Robertson 2004). 'Emissions' become enframed as units of economic valuation and a factor of production rather than an environmental variable that is being controlled through marketization (Knox-Hayes 2013). This is a common feature of market-based environmental policy and its pitfalls have been discussed at length (see especially Robertson, 2006).

Financial actors are quite comfortable with this language, however, and interact freely with regulators and other stakeholders using it when proposing market rules. Morgan-Stanley Capital Group (MSCG) has been among the most active of participants contributing to market design in workshops and public comments. They tend to weigh in most frequently (at least in public) on specifically financial matters, and they have an interest in the market both as a power importer and on

speculative grounds (MSCG 2009c). In design comments from the most intense period of regulation in 2009, most of MSCG's recommendations for financial regulation were adopted in a heavily restricted form, while their positions on power import accounting either were mooted by the collapse of the WCI or not adopted. To wit,

There should be no limit on who can participate in auctions based on entity type, or whether or not the participant has a compliance obligation. Arguments that non-compliance participants will “unnecessarily drive up prices” do not hold up to scrutiny. Prices at any given time will be determined by the market perception of supply and end-use demand ...To the extent auction participants without compliance obligations “overpay” for allowances, they will be subject to the “winner’s curse”...maximizing the number of auction participants, and ultimately, allowance holders, serves the public purpose of minimizing opportunities for market power or market manipulation, and helps *maximize liquidity and minimize volatility*. (MSCG 2009a, p. 1-2, emphasis added)

Despite the limited ways in which they were adopted, Morgan-Stanley were able to advocate successfully for some their positions in the above quote by mobilizing the sought after qualities of high liquidity and low volatility, or dramatic price fluctuations. In using relatively simple explanations of the complicated underlying economic theory, MSCG pressed for a more open market that would create mutually beneficial outcomes for finance, regulator, and society at large in creating a less constrained forum wherein the calculative rationality of market performance could take place.

The third set of roles finance is supposed to play, and which justifies their inclusion in market revolves around preventing market failures of varying description, including insufficient liquidity, and market inefficiencies created by

rapid price movements as touched upon in MSCG's statement above. These market failures are engendered by what we might think of as illegitimate performances of the market from the standpoint of regulators, but as legitimate trading activities by financial actors, incommensurabilities that are never fully resolved by regulatory framing practices that result in rules never truly becoming 'final' (Callon 2009, 541). The three primary potential market failures are insufficient liquidity, incomplete information, and insufficient oversight. Each of these could endanger market function, which by extension would imperil the market politically, an outcome that regulators consider unacceptable if they are to succeed at being a 'climate leader'.

The primary role that speculative capital is postulated to play in an efficient carbon market is to provide liquidity, a quality as amorphously defined as its name suggests. On one level, adequate liquidity simply means that there is enough money circulating in a given market that prices will not fluctuate wildly on the basis of large transactions that induce sudden market shocks. More subtlety, adequate liquidity demonstrates a mature market that participants believe capable of behaving as markets ought, will not be overly influenced by regulatory decisions, and will generate useful information about future expectations of carbon pricing through the collective wisdom of "the market" reflected in narrow bid-ask spreads. These conditions both allow for, and result from, the performance of calculative agencies amongst market participants that regulators hope will result in the efficient allocation of resources for reducing greenhouse gas emissions, reflecting the iterative nature of policy design and the tension between what Callon terms 'the economy' and 'the economic' (1998a, 28) wherein economic models can

demonstrate what is desirable for market function and market function creates the data which is modelable.

Liquidity in the California carbon market originates from a number of sources; explicitly speculative finance capital is one of them, but a key source is the surplus capital of large compliance entities that can behave both as compliance actor and speculator, like oil companies²¹. These companies are able to develop trading strategies potentially based on goals that are logical from a business standpoint but are dubious in terms of accomplishing the environmental goals that give rise to marketization in the first place (Lohmann 2011). Regulated polluters may be simultaneously trying to minimize compliance costs while also developing a trading strategy that will allow for profit-taking on their speculative investments in a commodities market they are learning about through their compliance obligations, supplemented by experience from other markets. While this is certainly consistent with the market objective of 'lowest cost emissions reductions', the potential to take profits from carbon markets in turn facilitates the expansion of polluters' core business functions, namely production that results in the expansion of polluting activities in the interest of expansion of shareholder value expressed in other capital markets.

In addition to allowing non-compliance activity in the auctions, regulators have built-in mechanisms for stimulating liquidity. The forced introduction of money

²¹ This would likely also be true of big electrical utilities were it not for their relatively more stringent regulation that prevents utilities from taking large speculative positions following the 2000 electricity crisis.

capital into the market ostensibly promotes 'predictable' behavior of markets in order to ensure that they function more akin to a 'real' market that would allow sophisticated participants to engage in the type of strategic trading behaviors discussed above. Based on lessons learned from the faltering EU carbon market, electric utilities are given most of the permits they need for compliance for free, but are then compelled to sell a portion of these in each auction (§95921(g)(3)). In order to obtain adequate allowances they must participate in the auction, inducing the circulation of capital. In effect, regulation has sought to turn electric utilities into “market makers” for the carbon commodity, acting as both buyer and seller.

Derived from the problem of insufficient capital moving through the market, the second market failure financial actors are supposed to remedy is that of incomplete information among market participants. Most economic modeling, formal and mathematical, is conducted with the assumption that all market participants have access to the same perfect information and will act as rational profit maximizing entities, which sums to perfect competition (Mann 2013), even though this is clearly not the case because of the asymmetric resources and human beings' capacity of taking non-economic concerns into their calculative rationality (see for example Stiglitz 1979). Inducing capital circulation is one way that money is thought to relieve these information asymmetries. One of the goals of making electric utilities act as market makers is to create a knowable price signal that can be communicated to all potential market participants. This price, arrived at through the calculated purchasing strategies of market participants, alerts polluters to the material cost of cleaning up their pollution *vis* the cost of purchasing more permits.

Providing as close to perfect information as possible is a role that has fallen to financial consultants and the financial press. The state can provide emissions data, aggregated statistics on auction bids, and guidance on potential rule making, it does not have the capacity or remit to publish daily spot prices or transaction volumes, or summary market sentiment. A number of consultancies and specialized media outlets have stepped in to fill this role, ranging from PointCarbon, a service of the publishing giant ThomsonReuters, to boutique services like CaliforniaCarbon.info, which aggregates market data and conducts periodic webinars for market participants as a portal for recruiting customers for its consulting arm. Finance contributes to this function as brokers make anonymous comments for daily market summaries, share their aggregated trades to produce summary statistics, and publicly debate different analysts' price expectations that can drive prices.

These consulting and information gathering functions are seen as particularly useful for small compliance entities that do not have the economic forecasting capacities or trading sophistication of their much larger counterparts (MSCG 2009b). Information asymmetries are often coincident with resource asymmetries – Chevron has extensive experience playing commodities markets and has dedicated trading staff who can bring carbon into its portfolio modeling exercises; a dairy in the San Joaquin valley that operates on thin margins and is merely looking to comply at the lowest cost possible is at a disadvantage that might be partially ameliorated through information provided through these specialist outlets.

The information gathering capacities of market participants and observers is not only seen as a corrective to information asymmetries, but also a potential check

on intentional malfeasance, the third market failure that traders could potentially head off. Market participants are encouraged to report suspicious market activity to the ARB and Monitoring Analytics for investigation. Regulators expect that experienced commodities traders will have better intuition for spotting irregularities. Despite the desire for the participation by financial actors, the need for market monitoring points to the tensions that arise in marketization, both structural and performative. Having seen the desires on the part of regulators that invited financiers into the marketization of carbon, we now turn toward the anxiety-inducing qualities of finance that has animated their restriction.

Market limiting factors

While affinities abound in the process of marketizing avoided climate pollution, tensions between regulators and the regulated community, within the regulated community, and between environmental NGOs and all other market interlocutors are productive of many of the market rules that “distort” the functioning of market, from 'pure' into something else. These 'distortions' arise from the periodic overflows of the regulatory frame that originate from pressures by way of both speculative capital and competing political interests. The tantalizing possibility of a smoothly functioning market that will allow California to press on with its climate policy leadership by way of a price discovering market is tempered by the demonstrated excesses of speculative capital. Ultimately these anxieties about creating an arena for pure accumulation that could become disentangled from the institutional structures that enable the market in the first place are the primary way in which stylized economic theory is made to take a compromised, if still structuring

role. These compromises must be made in order to keep the market relatively orderly with limited detrimental impacts on the underlying economy that carbon markets seek to clean up, but also changes market function as such.

There are a number of the ways that financial actors are constrained in their engagement with climate change gases. Auction participants must register with the ARB and report their holdings (§95941). This requirement limits any traders' ability to perform as anonymous actors in an idealized market or to disentangle the purchase of a carbon credit from its source of production since the purchaser, at some point, will have to surrender what it has bought to compensate for its emissions²² (Callon 1998a, 19). Any given entity is subject to limits on how many allowances it can hold based on its projected and historical emissions, or a hard limit on their long positions if they have no compliance obligation. Pure speculators have much lower holding limits than their compliance counterparts (§95920). This is thought to prevent market manipulation by preventing speculators from cornering the relatively small market. As previously mentioned, in auctions there is a price floor and ceiling (§95911, §95913), though this does not apply to secondary market trades as such a regulation would be beyond the jurisdictional authority of the ARB. Even so, secondary market prices track very closely to prices in the auction,

²² These entanglements are even more pronounced in trade in carbon offsets, wherein the credit can be voided post-hoc if the credit is found to have been produced in conditions that violate other environmental regulations or fail to achieve their promised emissions reductions; in California, buyers, rather than sellers, are liable if these credits are invalidated.

and very close to the floor price at that. Auctions are only held quarterly and the market is completely dependent on political backing.

There are several sources of trepidation that have led to the constraints placed on market participants to prevent market-malfunction, and they bear a loose relationship to proximity with the day-to-day activities of marketization. For law makers and some high level administrators who have a less thorough understanding of how environmental markets are supposed to work there is general malaise about creating a new financial product that 'feels' so abstracted from the more familiar realms of production and consumption. This reflects an innate sense that, in Polanyian terms (1944) terms, capital will always strive for disembeddedness, even from a market that is being created specifically to re-embed the overflow of climate pollution within the social. The anxiety of abstraction in creating a market for commodities that can never be experienced directly is most often heard in legislative hearings, though legislators have not moved to curtail the market in any significant way yet. Instead the regulators responsible for administratively defining the frame of the market have done the constraining.

A more acute source of wariness for regulators is the previously mentioned electricity crisis of 2000-2001 that followed the deregulation of the electric power sector. The potential for a repeat of the electricity crisis raises a number of concerns, including the rent seeking behavior of speculators, that high power costs would stifle investment in new renewable electricity capacity if capital is tied up in emissions allowances, the disproportionate impact high power prices have on low-

income consumers²³, and the political damage that would occur as a result. It is not only the risk of disembedding that gives regulators pause -- these fears are physically embodied by the participation by a few of the same actors involved in past malfeasance. As one anonymous research participant told me, "I think a lot of people would be surprised, and probably worried, if they knew how many of the same people [from the electricity crisis] were involved in the carbon market." (San Francisco, August 2013). These actors occupy roles in the carbon market as traders at boutique environmental finance firms and analysts at refiner's trading desks. There is also no shortage of market participants whose names tend to leave a bad taste. As of the February 2014 allowance auction, registered bidders included J.P Morgan Energy Ventures²⁴ and Koch Supply and Trading (ARB 2014a). Unregistered participation in derivatives markets may be more extensive. This is welcome news to some quarters of those involved in marketization, but for many regulators and regulated entities, the participation of too-big-to-fail bidders raises the specter of familiar overflows.

²³ Particularly because these communities already bear the brunt of localized power-plant pollution in the form of criteria air pollutants a group of six chemicals regulated by USEPA under the Clean Air Act (1990) that have significant impacts on human health, including lead and fine particulate matter (EPA 2012). Criteria pollutants are often found in high concentrations in industrial processes that produce greenhouse gas emissions. These matters of environmental (in)justice have been observed for some time. See Drury et. Al, 1999).

²⁴ JP Morgan was recently fined \$410 million for manipulating western energy prices (FERC 2013)

Beyond the concerns of speculative capital manipulating energy prices, another concern that arises with regularity is the market power²⁵ big compliance entities bring to the table. At a rule-making workshop hosted by ARB²⁶ that presented the work of the contracted economists on a number of proposals to improve market oversight, this concern was explicitly aired in a back-and-forth between an economist and a Chevron representative. The topic was public disclosure requirements for entities that own more allowances than their compliance obligation requires. The Chevron lobbyist argued that the firm might want to own surplus allowances for 'legitimate trading reasons' and that they were within their rights to own those allowances, and moreover, that to make that information public might lead to the perception that Chevron was trying to manipulate markets. The economist responded that, were that to happen, Chevron might have to issue a press release explaining their position, to which the Chevron lobbyist retorted that the public did not always take press releases at face value²⁷. The economist laughed and exclaimed, "I can't imagine why anyone wouldn't trust an oil company!" The entire room burst out in laughter (Sacramento, February 2014).

²⁵ Market power is one of two broad categories of malfeasance. The other is market manipulation (Borenstein 2013).

²⁶ Emissions Market Assessment Committee Meeting, November 13, 2013, at Cal/EPA.

²⁷ Chevron's Richmond refinery is among the biggest greenhouse gas emitters in the state and has a long record of environmental compliance failures, culminating in a fire in the summer of 2012 that send thousands of low-income residents to hospital.

This vignette is indicative of two tensions in the practices of marketization; the fear of market power held by compliance entities *qua* speculative capital and the fact that regulated entities often simply do not wish to be regulated if those regulations potentially hinder business as usual. ARB has already taken 'compliance action' in the form of financial penalties with a number of big emitters for failing to properly disclose their GHG output (ARB 2014b). For polluters, the potential for speculative profit taking through calculative performances in carbon markets must be weighed against cost savings of gaming the market, or getting rid of the regulations all together- a result potentially attainable if the market was shown to be susceptible to gaming that could weaken political support.

Even with all the restrictions on speculative capital, overflows necessarily remain possible within carbon trading regulations (Callon 1998a). While traders may have holding limits on the number of permits they can own, they can register with the Federal Electricity Regulatory Commission and contract to import a single megawatt of power into the California electricity grid, thus earning themselves a compliance obligation and double those holding limits (CaliforniaCarbon.info 2014). Leakage prevention measures dictated compliance entities not shift their purchasing of things like out-of-state power through reshuffling of contracts that would merely move covered emissions out of state while allowed the entity to claim reductions through any, "plan, scheme, or artifice", (§95802(a)(250). Regulated industry, in concert with the urging of the federal electricity regulator as detailed above, successfully convinced regulators that these rules could run afoul of federal electricity market rules and could put them at competitive disadvantage, and so

regulators have introduced a number of 'safe harbor' provisions that will effectively guarantee that leakage occurs (Cullenward and Weiskopf 2013). This is significant for market operation because it potentially reduces utilities' compliance obligation thus freeing up capital to use in other ways, reducing aggregate demand in the market which will exacerbate oversupply leading to continued price stagnation, all while eroding the potential for positive environmental outcomes. This is one of dozens of examples of how individual regulatory decisions designed to constrain overflows engender new ones and change the composition and circulation of capital in the regulatory framework.

Conclusion: Markets?

The product of the long discussions rife with tensions and affinities between regulators, regulated industry, financiers and others is a group of institutions through which anyone with enough money to buy a lot of 1000 tons of greenhouse gas permits can trade financial representations of climate change gases in the state of California, but with significant restrictions. The results of the attraction to, and anxiety with, financialization is a carbon price that has been remarkably stable. Since the market launched, a ton of carbon that can be used for compliance in the regulatory scheme has been between 10 and 12 dollars and has tracked very closely to the administrative floor price in the auction.

As California suffers perhaps the most visible impacts of climate change in the United States through persistent drought, significant floods, and dramatically reduced snowpack, the state is also engaged in the United State's highest profile

experiment to curb emissions. In order to press on as a climate leader, the state enrolled a multitude of actors with potentially divergent goals and intentions to build its cap and trade market. These actors range from environmental NGOs to manufacturers and economists, all of who have worked closely with one another for years to launch a carbon market, while avoiding the pitfalls to which others have succumbed by sequestering its carbon market from the more troublesome aspects of speculation. In constraining the trade in carbon allowances, regulators have created institutions that bear some resemblance to markets but that behave radically different than other strange markets that have come before. In a somewhat ironic twist, one of the intellectual progenitors of pollution markets wrote in 1968(b) that, "The market...is therefore nothing more than an administrative tool. But administrative tools that have some prima facie claim to efficiency should not be ignored in an increasingly administered society," (804). Even while the advocates of marketization have relied on discourses of the efficiency of unfettered qualities markets, regulatory checks on potential overflows has brought the California carbon market back to the roots of its creation- an administrative tool with market-like characteristics that reflect regulators' and their contracted economists' concerns with the potential for unhappy performances of their market devices. This is not entirely unwelcome from the perspectives of both regulators and those who are suspicious of market's ability to have a meaningful impact on climate change. To return to the sentiment expressed at the beginning of the article, "We didn't make a market for the sake of having a market, we're solving climate change!" If this is

indeed the case, then regulators have largely accomplished their goal of avoiding markets for the sake of marketization.

Chapter 5: Regulating fairness in the design of California’s Cap-and-Trade market²⁸

On January 1, 2013, California launched a cap-and-trade carbon market as the centerpiece of the most significant climate change regulations in the United States. The creation of this market is the result of seven years of legislative maneuvering and regulatory negotiation among myriad stakeholders. The bill that authorized the creation of market-based climate policy, AB32, The California Global Warming Solutions Act of 2006, offered significant discretion²⁹ to regulators on how to achieve California's emissions reduction goal of returning to 1990 levels by 2020. What has resulted is a state-based emissions trading system that will cover about 85% of the state's documented emissions when the program fully rolls out in 2015 (ARB 2011). The program also allows the limited use of offsets, or carbon credits that are created through physical interventions that reduce emissions in economic sectors that fall outside of capped industries. The market is part of a regulatory suite that blends direct regulations, including performance standards and clean energy quotas, with expansive market-based governance mechanisms. While the basic principles of carbon market design are fairly straightforward, the nuances in rule-making are multitudinous, the negotiations over those nuances protracted, and the

²⁸ This chapter will appear in an edited volume titled *The Carbon Fix as “Articulating fairness: The negotiation of carbon market design across axes of equity in California”*.

²⁹ AB32 is only 13 pages long. The federal Waxman-Markey climate change bill I was over 1400 pages long and contained nearly every design element conceivable, whereas AB32 did not even mandate the creation of market mechanisms, much less programmatic specifics.

number and types of interlocutors trying to influence all of the moving parts of the system are vast.

This chapter seeks to elucidate one of the key ways that stakeholders have tried to shape market rules to their liking, specifically through arguments about “fair treatment” in design elements large and small that almost invariably call for the costs to be imposed on industry and consumers to be minimized, turning matters of environmental governances into matters of cost containment. The number and types of decisions that must be made in order to implement any regulatory environmental market are substantial, but they are multiplied and magnified in carbon markets because of the more abstract qualities of the material being governed, the potential impacts on the productive economy that emits greenhouse gases, and the political visibility and stakes of regulating climate change gases (Boycoff and Yulsman 2013; Tietenberg 2006; Bumpus 2011). These decisions range from the broad, such as how to distribute pollution permits among different industries, to the specific, such as accounting for the ways that power import contracts are written and for the emissions embodied in that power.

In California, regulated industry, industrial business groups, financial concerns, market-enthusiast environmental NGOs, academics, and sundry others have argued about market design elements using nearly every rhetorical strategy imaginable, from cajoling, to threatening, to reasoning, and sometimes even pleading. These strategies are deployed using the language of economic efficiency, political expediency, or technological feasibility. But one commonality across all of

these strategies, and the languages used to express them, is the presence of sentiments relating to just and fair treatment under the regulation. In the course of rule making, “fairness” has come to be defined within a narrow register, reflecting one pole of thought on how carbon pricing can achieve desired outcomes. This is chiefly through cost containment for regulated entities rather than through establishment of a substantial price on carbon that would induce changes in the composition of polluting industries in California.

The US Federal Government recently updated its social cost of carbon to \$37 dollars a ton, which refers to the total social and environmental benefits that accrue from avoiding the emission of one ton of CO₂, or alternatively, the damage done by releasing that ton of CO₂ (IWGSCC 2013). Some models indicate that the price needed to induce structural change to a low carbon economy, sufficient to avoid catastrophic impacts of climate change, is around \$200/ton in the United States (Hope 2013). Throughout consultation on the creation of the cap and trade market, regulated industries in California have repeatedly demonstrated that a price of that magnitude is unacceptable, and regulatory decisions indicate concurrence on the part of the state (ARB 2010b). This points to a potential contradiction in the development of carbon markets, where price is supposed to engender widespread socio-technological change, yet the price signals allowed by political compromises in the regulatory design process may not be sufficient to achieve transition to a 'green' economy.

The main argument of the chapter is that in the development of the rules of California's carbon market, stakeholders' claims about fair costs in the formulation of the program resulted in a rhetorical inversion: What started as a program with the potential to make 'polluters pay', embodying the economic notion that a substantial carbon cost would drive down emissions of both climate change gases and co-pollutants, was transformed to a situation where 'pay to pollute' became the operating principle. Environmental justice organizations have long feared such an outcome, believing that emissions will not be avoided and that polluters can eschew responsibilities to impacted communities through accounting tactics and the outsourcing of reductions with offsets.

The chapter begins with a brief discussion of the methodological approach taken to creating and analyzing the data on which my arguments are based. It then describes how "fairness" was deployed in the rule-making process for the California cap-and-trade program, and how the concerns of environmental justice advocates came to be sidelined through the regulatory decision to conduct a specific kind of carbon pricing. I will consider how industrial advocates were able to make ideas about fairness largely a matter of cost reductions in order to influence specific aspects of the regulation. The chapter will demonstrate the success of these arguments in shaping market rules, resulting in a situation where many more allowances than needed to raise the price of carbon to a behavior-changing level were given away. Along with free allocation, the widespread use of offsets and the

relaxation of rules around electricity imports have blunted the price signal that is supposed to be the driving force for changes to the underlying economy³⁰.

Methods and data

The analysis in this chapter is based on fourteen months of fieldwork in Sacramento, California, the capital of California and home to the California Air Resources Board (ARB), the agency tasked with implementing the climate law. California has both a tradition of cutting-edge environmental policy-making and strong public transparency laws, which make it an ideal location to examine how innovative environmental policy is implemented (ARB 2010a, CGC §11120-11132). I also undertook a textual analysis of presentations by regulators, draft regulatory text, and publicly available comments on these regulatory documents by stakeholders from 2008 to 2013, on topics ranging from new offset protocols to public information disclosure. I used Nvivo qualitative data analysis software to code for an initial set of terms, used the terms to find related ideas, and then recoded the texts using both sets of terms relating to just, fair, consistent, or reasonable treatment, what Crabtree and Miller term the 'immersion/crystallization' method (2009). For each of these data points I coded two kinds of information: a) the type of organization making the argument; b) the way that ideas about fairness were being constituted.

³⁰ The EU-ETS is the current example *par excellence* of what happens when a carbon price drops precipitously. Its failures to deliver emissions reductions are well documented (Carbon Trade Watch, 2012). California has avoided some of the pitfalls experienced by Europe by preventing windfalls profits to the largest polluters despite the number of free permits allocated to them.

24 kinds of organizational actors were recorded deploying arguments about fairness³¹. The groups that most often made arguments related to fairness were compliance entities; the polluting businesses that are required to participate in the cap-and-trade market. This category includes both investor-owned and publicly owned utilities (39 and 31 comments, respectively), oil refiners (22), and power traders and importers (22). The second largest set of actors who made claims on behalf compliance actor using arguments about fair treatment and application of the carbon market were industry and business lobbying groups. Among these, the most prevalent were electric power industry lobbying groups, particularly the Western Power Trading Forum (51 in total) and Joint Power Authorities (25). Oil and petrochemical refining groups often made these kinds of arguments (17) and environmental groups also made sustained efforts to influence market formation using arguments of fairness, both on their own and in coalitions (56). The remaining organizational actors express the breadth of those trying to influence the deployment of cap and trade in California, ranging from borax mine owners, insulation manufacturers, and academics, to actors specific to carbon markets, such as the International Emissions Trading Association and offset developers.

In coding for notions of ‘just’ treatment under the regulation, 27 different ideas about fairness were identified. It is perhaps unsurprising, given the diversity of participants, that arguments about specific aspects of the program, and the

³¹ This coding exercise excluded comments from Environmental Justice groups, of which there were only three. Environmental Justice organizations stopped trying to influence many aspects of the regulatory process in 2010 for reasons explained in the next section.

desirability of the program itself, are varied, often complicated, and in some cases, contradictory. Indeed, as noted by a coalition of environmental groups regarding how to allocate emissions permits, “most options could be called ‘fair’ from the perspective of some party” (Coalition, 2009), but this statement could be applied to nearly any topic under consideration. Statements about fair treatment attempting to influence the regulation were often about matters of spatial governance (77), enforcement and administrative burden on regulated entities (43), perceived inequity either between industrial sectors or between entities in the same industrial sector (70 and 71, respectively), perceived reasonableness of compliance costs (53), and used as an overarching theme to structure entire regulatory worldviews (31). Finally, many arguments about fairness pertained explicitly to the idea that just outcomes were best achieved through the unfettered operation of markets (83), despite the many other arguments that this had too much potential to create unreasonable costs to polluters. This balance between creating a market wherein capital can circulate akin to other commodities markets while not creating a price that is too high is a key challenge for regulators in market construction. The regulators must balance the logics of neoclassical economics that animate the creation of a carbon market in the first place with the real possibilities of the market ‘malfunctioning’ (See Chapter 3). The market could potentially fail in any number of ways from the perspective of regulators, including the possibility that prices fluctuate wildly (high volatility), or that the carbon price rises to a level that substantially increases consumer costs for energy in either electricity or gasoline (or both). A dramatic increase in the volatility of California’s carbon price could

make it difficult for polluters to plan for costs associated with installing physical emissions reductions equipment on their facilities, which ultimately is the motivating environmental factor behind the regulation, while big hikes in the price of essential energy needs for consumers would undoubtedly cause political backlash. Indeed, the very possibility that gasoline prices could rise as a result of cap and trade has already led to the introduction of several bills into the California legislature that would either suspend the inclusion of fuels from under the cap, or take them out entirely (White, 2014). The situation regulators face is that markets created by government can lose political support. If political support is withdrawn, it could cost the regulator the opportunity to regulate greenhouse gases at all in the short term, and damage California's progress toward achieving its overarching emissions reductions goals in the long term.

Legislating fairness

California is one of the few jurisdictions that have codified ideas about environmental justice in state law, where it is defined as “the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws and policies,” (§65040.12). However, not all claims to fairness are equally influential. Many claims about fairness at the beginning of AB32 rule making were concerned about the use of market mechanisms at all. Environmental justice (EJ) groups actively mobilized against using markets, drawing on voluminous literature on the potential for market mechanisms, and particularly the use of offsets, to create or exacerbate the unjust distribution of the negative consequences of pollution (see for example Chan 2009,

Pastor et. al. 2010, Lohmann 2011). These ideas about justice, and specific cases of environmental injustice related to the spatial distribution of greenhouse gases, impacts of pollutants that often occur alongside greenhouse gases like fine particulate matter, and unequal impacts of climatic change in California, did not fall on deaf ears. Regulators I spoke with do take environmental concerns seriously; after all, the mission of the Air Resources Board (ARB) is primarily protection of public health. Further, the text of AB32 specifically directed ARB to convene an Environmental Justice Advisory Committee (EJAC) to alert ARB to potential unjust outcomes impacting economically disadvantaged communities and communities of color (§38591). Other regulatory action taken by ARB is designed to combat criteria pollutants³², though not at the pace that impacted communities and their advocates would like (EJAC 2014).

In terms of actual regulatory outcomes from the rule-making process for cap-and-trade, the claims of EJ advocates failed to make much of a material difference. Offsets can be used to fulfill about half of polluters' emissions reductions (Haya n.d.); and while the reduction of co-pollutants through GHG emissions reductions is seen by regulators as a positive outcome, it is not one of the key goals of the market³³. Indeed, the only area where environmental justice advocates made

³² Criteria pollutants are six toxics regulated by USEPA that have significant negative impacts on human health, including fine particulate matter and lead (USEPA 2013). Criteria air pollution has fallen statewide since the early 1980s, though some areas of the state continue to have the worst air quality in the United States, and those areas map quite neatly onto poor communities of color (CalEnviroScreen 2014).

³³ In an early victory for EJ advocates, the text of AB32 does prohibit the increase of criteria pollutants in 'environmental justice communities' as a result of regulatory compliance (Perkins, 2014/forthcoming). Industrial and academic interlocutors

headway was in achieving legislative direction that at least 25% of revenues generated through the auction of emissions allowances must be directed to reducing emissions in state-designated 'environmental justice communities' (SB535). Even then, the way that these funds can be spent is still subject to other juridical conceptualizations of fairness, stemming from state case law about the use of revenues generated by fees (*Sinclair Paint vs. State of California*). Most EJ groups were (and still are, EJAC 2014) opposed to the implementation of any form of market environmental governance that would allow the perpetuation of patently unfair distribution of environmental externalities (EJAC 2008, Barboza 2014). Nevertheless, many stopped trying to influence the regulatory process when it became clear that cap-and-trade would go forward and include the use of offsets because many environmental justice advocates felt their position was not being taken seriously. Further, most of these organizations lacked adequate resources to engage with rule making as it became increasingly oriented around the technical details of the design of a market to which they were opposed. This is borne out by the suspension of the Environmental Justice Advisory Committee that AB32 required. The advisory committee was eventually reconstituted, largely with different members in 2013 after a three-year hiatus. But in the meantime EJ advocates reoriented their strategy to litigation and legislative lobbying efforts to

opined that regulating criteria pollution through cap-and-trade would be ineffective because it would distort market performance, resulting in increased prices and potentially uneven compliance costs depending on differences in criteria emissions from different kinds of processes, (Analysis Group, 2009).

redress their grievances³⁴ (Perkins, forthcoming). The absence of these groups gave others more space to discuss different ideas about fairness.

Other kinds of appeals to fairness have indeed proven more successful at moving the regulatory needle. These claims are made by regulated entities and their industry associations, often dealing with programmatic minutia that fail to generate much excitement beyond the handful of people in the room considering a particular rule change. The ways that appeals to fairness are framed can help us to better understand what kinds of claims are effective at creating incremental changes that then add up to major programmatic characteristics, ultimately substantially altering function and, in effect, defining what the market is for. In the case examined here, the arguments framed California's contribution to climate change as an industrial and technological problem, one that could be solved through economic regulation predicated on neoclassical economic efficiency rather than the large-scale social transformation that the challenge of climate change requires (Klein 2014).

This was demonstrated as early as 2009, during arguments about how to allocate emissions permits. ARB gave specific instructions to a group of economists hired to conduct analysis to look for allowance allocation options that would be simple, fair, cost-effective, and environmentally effective. Fairness became a design criterion primarily of interest to regulated entities, especially because, as noted by a coalition of environmental groups, definitions of 'fair' and 'environmentally

³⁴ Unsuccessful for the most part, as cap-and-trade survived EJ groups' lawsuit, as well as lawsuits from the right brought by business associations seeking to enjoin any attempts to mitigate GHGs.

effective' were much less well developed than those mandating simplicity and cost containment (Coalition 2010). The recommendation for simplicity in particular was made explicitly, as ARB's contractors noted that increasingly convoluted schemes to distribute emissions permits commensurately increased the possibility that the allocation system could be susceptible to cheating or to political claims of differential treatment. The weakly defined recommendation for fair allocation gave interpretive license to those who would claim the mantle of fair treatment, even while the imperative to keep costs down was explicitly delineated. Over the course of initial implementation, programmatic goals were evacuated of their transformative potential and took on Swyngedouw's imperative of finding ways "to change so that nothing really has to change" (2009).

The topics of discussions invoking fairness discourse are as varied as the arguments themselves, but here I will analyze three key decisions influenced by claims about fairness that are emblematic of the rule-making trajectory toward cost containment. The first is broad, and revolves around how to distribute emissions permits to regulated industries. The second is specific, and deals with the relaxation of rules pertaining to a phenomenon called "resource shuffling". The third illustrates the ability of regulators to push back on claims to fairness made by industry through limitations imposed on the expansion of the offset program.

Matter of fairness 1: Allocation

In California, once emissions levels were determined, a cap set, and regulated industries identified, the ARB had to decide how to allocate emissions permits.

Research participants told me that this was the most divisive and important decision in market design. The options for allocation included conducting of an auction through which regulated entities purchase their pollution permits; distribution of permits for free to regulated industries; or some combination of the two.

It is easy to see why regulated industry would fight against auctions. Based on the decision to compel all polluters with emissions of greater than 25,000 tons of CO₂³⁵ per year to participate in the market, auctioning could create substantial costs for the biggest polluters like oil refineries and electric utilities, and be potentially burdensome for the smallest polluters, including food processors or universities that operate on slim economic margins. These high costs would potentially arise through two distinct mechanisms. The first is simply that polluters would have to pay out to compensate for their pollution at all, rather than receiving their permits for free (though, of course, this is the very point of the market). The second is that uncertainty around the carbon price would require polluters to preemptively allocate capital for emissions permits, thus foregoing other, potentially lucrative, investments, including those in emissions reductions strategies. Full auctioning was advocated by environmental justice organizations and most environmental advocacy groups on the grounds of 'polluter pays', the idea that emissions permits represent the distribution of privatized slices of a global atmospheric commons. In

³⁵ The measurement used in regulatory documents is tCO₂e, or tons of carbon dioxide equivalent. This is used in order to equate six different greenhouse gases in terms of their potential to warm the atmosphere (see MacKenzie 2009).

this view, the proceeds of that privatization ought to go to the state, ultimately to be redistributed to the public to generate a powerful incentive for polluters to reduce their emissions. Auctioning was also advocated, primarily by academic commenters, on the grounds that it would be more akin to a 'true' market through the generation of a price signal representative of the physical cost of abatement³⁶ (EAAC 2010). Empirical analysis has also shown that substantial free allocation can undermine other program goals, as was the case in the European Union carbon market that led to delayed emissions reductions and prices under one euro per ton (McAllister 2009).

The decision on auctioning versus free allocation was further complicated by numerous existing regulations and restrictions exemplifying the tension between the economic theory that supports market environmental governance on one hand, and the practical implementation of market devices on the other. Given that markets are supposed to achieve environmental objectives through a price signal for both industrial producers and consumers, free allocation would presumably mute this signal, leading to continued 'irrational' behavior as far as polluting the atmosphere was concerned. However, AB32 specifically directs ARB to minimize 'leakage', which occurs when "a reduction in emissions of greenhouse gases within the state... is offset by an increase in emissions of greenhouse gases outside the state," (AB32, 4) This situation arises when producers move their operations out of the regulated

³⁶ The question of what a price signal in environmental markets actually represents is convoluted, as is any discussion involving value, state, and nature (Robertson and Wainwright 2013). See Chapter 3.

territory in order to avoid the added pollution cost. Arguments about free allocation and its relationship to leakage generated voluminous comments, often pertaining directly to fair treatment of producers, the relationship between producers and consumers, and to the economic theory underlying the program.

Arguments about spatial equity and leakage minimization also centered on connecting California's market to other jurisdictions' carbon markets. California's market was originally conceived as part of a regional carbon market, the Western Climate Initiative (WCI) that was to cover most of the western United States and Canada (WCI 2008). Following the ascension of Republican legislatures across the western states in 2010, most of those jurisdictions withdrew their support, leaving California to 'go it alone,' a situation perceived by industry as fundamentally unfair because of the product market distortions caused by carbon pricing, particularly when climatic benefits of abatement accrue globally³⁷. The withdrawal of other WCI jurisdictions has given rise to increasingly urgent commentary about leakage potential. The AB32 Implementation Group, an industry group, urged ARB to, "immediately amend the regulation so that all industries will be allocated 100% of allowances thereby eliminating the auction. This is reasonable given that there is no strategy to address leakage and job loss created by an auction" (AB32 IG 2012, 1).

³⁷ This is the 'free-rider' problem that Pigouivan (1920) policies are designed to address in the first place, and points to other challenges for any attempt to regulate GHGs absent coordinated global effort.

To attempt to allay these fears and comply with the AB32's leakage minimization requirement, ARB developed convoluted formulas to determine how much pressure from imports each industry was under both domestically and internationally in the case of high energy-intensity goods like concrete, and other goods that face import pressure, like canned food. ARB then assigned free permits to these companies based on their industry's risk of being undercut by industry in jurisdictions without carbon constraints. The initial regulations provided significant assistance to a majority of covered industries, to the tune of around 90% free allocation in the first compliance period that runs through 2015. However, lingering concerns about the health of the California economy, coupled with sustained lobbying on the part of regulated entities, resulted in across-the-board increases in allocations to trade-exposed industries, ranging from breweries to natural gas suppliers. This will reduce the number of allowances auctioned by more than a quarter in 2015, and eliminates the need for auction participation for some industries through 2020, the entire design life of the market (Doan 2013). Under current regulations, ARB is projected to give away over 700 million permits, representing 700 million tons of CO₂, over the life of the market just to utilities, which is roughly the equivalent of the climate pollution generated by Germany in one year (Cullenward and Weiskopf 2013, UNFCCC 2010). 54.3 million allowances will be given away to industrial emitters in 2014, including refineries operated by some of the most profitable companies in the world (CaliforniaCarbon.info 2014; Grady and Weinzimer 2013). The final regulations and allocation of emissions permits was a blend of auctioning and free allocation, with free allocation

accounting for the vast majority from 2013-2015, and a smaller majority of permits given away for free from 2015 forward. While polluters have paid the state \$872 million for emissions permits through auctions from 2012 to 2014, polluters have avoided paying for billions more worth of permits through free allocation.

Matter of fairness 2: Resource shuffling

Another outcome of the rule-making process that dramatically changed the California carbon market program was the relaxation of prohibitions around a practice called “resource shuffling”. This occurs when a company that imports power from outside the state changes its power-sourcing behavior to favor lower carbon sources. This allows it to decrease compliance obligations within the state, but may not actually engender any material reductions in emissions if that power is then sold elsewhere in unregulated markets. For example, a California utility could contract to buy hydro power from Oregon rather than coal-fired power from Arizona, but that coal power would still be used elsewhere, resulting in no net emissions reductions. This is a matter of concern in California; while the in-state energy mix is relatively clean, the state imports about 30% of its power, almost 75% of which is coal-fired generation. (Cullenward and Weiskopf 2013 cited in Rossi and Smith 2014). A provision in the initial regulatory text forbade resource shuffling defining it as any, “plan, scheme or artifice to receive credit for emissions reductions that have not occurred, involving the delivery of electricity to the California grid” (§95802(a)(250)).

Power generators, importers, and their business allies argued vociferously that a blanket prohibition infringed on their ability to conduct business as they otherwise might, to comply with other regulations that encouraged the winding down of power import contracts from out-of-state coal generation, and could ultimately destabilize the power grid in California. As argued by PowerEx, the energy exporting branch of B.C. Hydro,

[t]he definition of “Resource Shuffling”... is too vague and too subjective to provide the regulated community with adequate certainty as to what ARB will consider to be legitimate electricity imports and which it would deem to constitute illegal “resource shuffling.” There are two critical problems with the definition. First, the term “any plan, scheme, or artifice” is inherently subjective and requires ex post facto determinations of intent. What a member of the regulated community may genuinely believe to be a plan to pursue normal market incentives may be viewed by another as an illegal “plan, scheme, or artifice, (Beveridge and Diamond 2012, 3)

As a result of these and allied arguments, ARB ultimately adopted 13 'safe harbor' provisions while nominally preserving the prohibition against resource shuffling. These safe harbors are regulatory provisions that clarify practices that will not count as resource shuffling and remove the provision for executive to legally attest under penalty of perjury that resource shuffling has not occurred. Cullenward and Weiskopf (2013) have demonstrated these safe harbor provisions are likely to result in significant leakage, damaging the environmental efficacy of the program both directly through increased emissions, and indirectly: lowered demand on the part of utilities and power importers for allowances will serve to further depress prices, muting price incentives. Safe harbor provisions could result in leakage of between 108 and 187 million mtCO_{2e}, which corresponds to *up to 197% of emissions*

reductions mandated by AB32 (Cullenward and Weiskopf, 2013, see Kama 2014 for a contrasting case in the EU-ETS). By arguing that prohibitions against resource shuffling could damage the core business of power importers and create uncertainties in the western power grid, regulated entities were able to dramatically alter the overall function of the market. This alteration has already resulted in three large power import contracts by California's largest utilities being rewritten, as clean in-state power has replace dirtier out-of-state power (Cullenward and Wara, 2014). While this is good from a California accounting perspective, it does little to change aggregate climate pollution and serves to further depress the prices of California carbon allowances because of reduced demand, and thus reducing power generators' cost of carbon.

Matter of fairness 3: Expansion of offsets

Offsets, or emissions reductions and resulting credits from activities occurring in economic sectors outside the cap, can be used to satisfy up to eight percent of a polluter's compliance obligation. But what this means in practice is that roughly half of the mandated aggregate emissions reductions could come from offset credits, as the cap on California's total emissions represents a 15% decrease from baseline emissions. (Haya, n.d., ARB 2014). This raises concerns about polluting industries simply buying their way out of making serious pollution reductions, and about the attendant health impacts of the co-pollutants created in industrial processes. The eight percent limit doubles the original limitation proposed in the draft regulations issued by ARB in 2009, and was a move to make compliance entities more willing to accept the program as a whole (CEI 2010). This

decision came on the heels of lobbying by groups such as the California Chamber of Commerce (2010), which argued that,

A well-designed program is one that includes a broad use of offsets. Policies that increase the likelihood of an inadequate supply of offsets and the inability to link to other cap-and-trade programs will greatly decrease the potential for a cost effective California program... CalChamber is supportive of increasing the offset availability to at least 8% of total emissions under the cap, again emphasizing the importance of offsets as an effective cost containment mechanism.

Doubling offsets allowed under the cap has increased the theoretical maximum of offsets that can that be used for compliance to 25.8 million CO₂ in the first phase of the program. The quantitative maximum will expand commensurately in 2015 as transportation fuels, and their associated emissions, are brought under the cap regulation., which will more than double the number of offsets allowed. Currently, offsets credits can only originate within the United States and Canada, through regulators have signed memoranda of understanding with Acre, Brazil, and Chiapas, Mexico in hopes of gaining legislative approval to expand the offset program internationally (Brown 2014).

There are a number of things that offsets are supposed to do for the market. Primary among them is to serve as a cost-containment mechanism, by providing an option to regulated entities that that is less costly than obtaining permits to pollute in the open market or than actually reducing emissions (ARB 2010b). The inclusion of offsets in the California program is predicated on the conceit that all emissions reductions, regardless of how or where they happen, are entirely fungible or

equivalent in ecological terms, an already questionable proposition and point of contention for environmental justice advocates (McAfee 2012).

This supposition of universal fungibility has engendered continuous pushback on limits to offsets by regulated industry and the developers of offsets, even after the limits were doubled. They concluded that if all emissions reductions are equal, and that air pollution with direct impacts on human health like fine particulate matter or ozone is best ameliorated through targeted regulation, then there should be no limit to the amount of offsets they can use (AB32 IG 2009). Other quirks in California's offset system include buyer liability in the case that ARB finds an offset project to have not fulfilled its promised emissions reductions according to standardized methodologies, a limited number of approved offset methodologies, and the geographic restriction of offset creation. These quirks create theoretical limits, but thus far they have not, and may never, be reached (Thompson Reuters 2013).

While EJ advocates were (and continue to be) against the inclusion of offsets in the program³⁸, environmental groups were in support of limited (though still fairly expansive) inclusion, while regulated entities, their industrial associations, and the offsets industry have continually pushed for unlimited usage. This is one area where advocates for reduced usage of offsets have had success, despite widespread and sustained pressure on regulators by industry to do otherwise. This

³⁸ EJ advocates have taken the legislative lobbying approach to limiting offsets spatially and quantitatively though the introduction of a series of bills, though these have been unsuccessful so far.

demonstrates that, among other things, it is inappropriate to understand ARB as 'the handmaiden of capital', acting solely on behalf of regulated entities, but rather as a regulator acting within increasingly path-dependent policy options, bounded by the master narrative of cost control.

Regarding buyer liability, the rule states polluters who buy offsets that are subsequently invalidated because the offsets were found to have not achieved their promised emissions reductions or were not generated in accordance with other environmental regulations are responsible for replacing them, rather than the producers of those offsets, the Western Power Trading Forum (2009, 3) argued that, “[s]uch a buyer liability rule would be patently unfair to covered entities, who would effectively be penalized for the misconduct of others.” In regards to limitations on the variety of offset protocols eligible to generate credits, The Carbon Offset Providers Coalition argued, “standards-based offset methodologies provide the most efficient, objective and easily calculated means for determining whether a given offset project should be approved or not. That said, ARB also should provide means by which new offset project types can be approved on a case-by-case basis” (2010, 6). Regulators rejected both of these arguments, though they continue to explore new protocols.

One of the key arguments for increasing the usage of offsets is that if emissions reductions from all sources are truly fungible, then it is unfair to limit the amount of offsets compliance entities can use (and developers can develop, and brokers can broker) on both ecological and economic grounds. Despite analyses of

the market that demonstrate moderate to severe oversupply of allowances through at least 2019, compliance entities and offset developers continue to make dire predictions about price spikes that can only be mitigated through the dramatic expansion of the offset program (Thompson Reuters 2013). Compliance entities' dissatisfaction with the limited availability of offsets is illustrated by the similarity of comments about the fairness of restriction offsets that read nearly identically from 2008 to present.

However, things have changed from an EJ perspective as negotiations for underdeveloped world offsets continue, new offset protocols are approved, and contracts for offset provisions are increasingly being standardized in a way that reverts buyer liability to the producer rather than the purchaser, increasing the likelihood that polluters will pay their way out of reducing emissions as much as possible. The inclusion of forest based REDD+³⁹ offsets from Mexico and Brazil has been simmering, as ARB and California Governor Jerry Brown have reiterated their interest in developing protocols forest based offset protocols in the global south (see Blanchard and Vila, 2015). These lay the groundwork for future collaboration on the deployment of REDD+ projects if ARB lifts its current spatial restriction on offset credits that currently limit their creation to the United States and Canada, ROW 2013). ARB has also recently approved a compliance offset protocol that will

³⁹ Reducing Emissions from Deforestation and Degradation. REDD+ projects are designed to pay communities in the Global South *not* to cut down forests. These projects are demonstrably problematic from social, economic, and ecological perspectives, often leading to outcomes that do not reduce emissions while excluding forest-dwelling communities from livelihood strategies on which they had depended (Beymer-Ferris and Bassett 2013).

generate credits for flaring methane from inactive coal mines, which detractors claim will unduly profit the coal industry, effectively the inverse of what climate policy through price mechanisms is supposed to accomplish (SELC 2013).

The use of offsets as a cost-containment mechanism again signals the degree to which California's carbon market came to embody a pay-to-pollute mentality. Offset, particularly those of dubious environmental outcomes like payments to coal mine operators for flaring methane, allow polluters to pay for emissions reductions without actually reducing any of their own, and at prices even lower than permits bought at auction. Offset credits generally trade for several dollars lower than permits (CalCarbon.info 2014). This price discrepancy represents the risk that buyers' assume when purchasing offsets because they are ultimately liable to replace the offset credits if the ones they have purchased are found to have not generated the promised emissions reductions. However, regulators have not accented to every request made by polluters regarding offsets. Many regulated companies have argued that it is unfair to limit offsets either in quantity or on the basis of their location, as they claim that since greenhouse gases are globally fungible, emissions reductions should be treated the same no matter where they originate. However, ARB has thus far maintained both restrictions, demonstrating that it is inappropriate to see the regulator as merely honoring the wishes of polluters. However, the continued ability for polluters to buy their way out of doing the difficult and potentially expensive work of reducing their facilities' emissions remains a way that prices are kept low and ensures the continued production of pollutants that are coproduced with the burning of fuels that lead to GHG emissions.

Conclusion

Generous free allocation of pollution permits, stubbornly low prices, and persistent questions about carbon markets' abilities to alleviate environmental and social injustices seem to be ubiquitous in the construction of cap and trade markets. By examining the ways that competing notions of fair treatment under California's Global Warming Solutions Act were deployed by diverse stakeholders, this paper demonstrates some of the mechanisms by which 'pay to pollute' comes to stand in for the more transformative formulation of 'polluter pays'. California has taken important steps to begin reigning in greenhouse gas emissions, but the focus on maintaining low costs for regulated industry has likely limited the regulation's ability to create a more just emissions landscape. A high carbon price could reduce climate pollution and co-pollutants associated with industrial production in the state. When environmental justice groups abandoned attempts to influence market design after it became clear that carbon trading would become the centerpiece of California's climate change strategy, industry and their allies maintained significant pressure on regulators. Environmental justice organizations did not want to authorize the use of trading mechanisms they saw as detrimental to the communities they represented, did not have the capacity to intervene in increasingly technical discussions of market mechanisms and pollution accounting, and, most pointedly, felt that their advice about the best way to create emissions reductions had been ignored by regulators.

Polluters couched their arguments in the language of fairness, to advocate for policies that would perform to their benefit. In doing so, the door was left open to

the possibility that California polluters would be well supplied with options to comply with the law by way of low carbon prices and abundant offsets. These options reduce compliance costs for covered entities and blunt the transformative potential of attaching a price to carbon emissions. This does not necessarily mean that the market will not achieve its quantitative goals for relatively modest emissions goals; indeed, it appears that California will quite likely meet its 2020 target (ARB 2014). But this success may well be predicated on falling emissions from changing macro-economic factors, and pollution will simply be paid for as a cost of doing business by polluters. Changes to the regulation also open the possibility for resource shuffling in the form of shifting contracts for imported electricity from dirty sources to cleaner ones that result in no net emissions reductions, and an expansive use of non-local offsets that fail to address the causes of longstanding unequal health impacts of air pollution in California. The changes were achieved in part through the appropriation of the language of fairness and equity by the very polluters the regulation was designed to constrain. It seems that transformative carbon reduction impacts will more likely be achieved via direct regulation, such as renewable energy standards and other policies that are described as merely 'complementary' to the carbon market.

Chapter 6: Conclusion

Climate change is a big problem and California has employed some big ideas to start to get a handle on the state's contribution to global greenhouse gas emissions. The state is seeking to reduce its climate footprint to 1990 levels by 2020, with a further 80% reduction by 2050. This long-term goal is a laudable, ambitious goal and one that should be replicated, if not improved upon, by jurisdictions across the Global North. In order to meet its climate goals the state has pursued a diverse set of policy measures that include a suite of mitigation and adaptation activities. The primary program that backstops those goals and programs is cap-and-trade, which is designed to ensure emissions reductions occur even in the absence of other mitigation mechanisms, and by which adaptation activities can be funded by the proceeds of allowance auctions. Market measures to reduce greenhouse gas emissions have a dubious track record globally, but California has gone to extraordinary lengths and employed creative means to avoid the pitfalls to which other emissions trading systems have succumbed. These measures ultimately complicate our notions of what markets are for, what they do, and what they achieve.

In this concluding chapter, I will summarize and reflect on the arguments I have made in this dissertation, including the political ramifications of understanding California's cap-and-trade program as something that falls between a financial market and an administrative carbon price. This is the fundamental contribution of the dissertation, which is explored across several topical and theoretical dimensions. After reflecting on the arguments, I will discuss further empirical issues

that merit study in relation to California's cap-and-trade program, and move on to consider how the conceptual apparatus might be strengthened in future studies of regulator-mediated and private sector environmental-financial products.

Specifically, these products need careful investigation in terms of standards and risk; risk must further be understood in both environmental and financial senses.

At the outset of fieldwork in 2012, this dissertation set out to discover the principles, practices, and actors required to construct a market in avoided greenhouse gas emissions. What I found was ultimately much more interesting than a typology of people and ideas enlisted in California cap-and-trade. The landscape of the commodification and marketization of carbon is highly variegated, but not to the degree I expected; there was a certain unity of purpose across types of actors and individuals that gave program design a much higher purpose than simply creating a new speculative opportunity for financiers that bore some loose relationship to the climate. Instead, I was somewhat astonished to discover the relatively high degree of consensus among all actors that California should seize the opportunity to move quickly and decisively on climate change for policy interlocutors ranging from the regulators themselves to lobbyists for electrical utilities. That not does mean there was unanimity about most of the key design elements, quantification regimes, or even the exact purpose of cap-and-trade – indeed, there were protracted, intense struggles over almost every line of regulation. These struggles are not necessarily the mark of political difference. Instead, the data that forms the basis for this dissertation reflects the degree to which the creation of market mechanisms are rather more technocratic practices of management than the contested politics of

systemic transformation. This observation can be read in two ways. For politicians and regulators tasked with creating a climate policy that does not fundamentally alter the relations of production and consumption in the state while pursuing cuts to greenhouse gas emissions in line with statutory obligation, the process cannot be seen as anything but a resounding success. In the three years since the beginning of the program, prices for consumer energy have not jumped, the economy continues to recover from the devastating recession (though unevenly across time, space, and axes of difference), and state politicians seem satisfied by the pace of regulatory deployment. Greenhouse gas emissions have also dropped in the state (ARB 2014), but the degree to which that is due to AB32 measures is still unclear.

From the perspective of critical heterodox political economy, the creation of the cap-and-trade program is emblematic of what Swyngedouw (2008) called the post-political condition. In regulators' desires, in line with the economic theory that underlies marketization in the first place, to displace the administrative burden of greenhouse gas reductions from polluters onto the state, the hyper-technical nature of the regulation creates a condition of political incontestability that is inaccessible for vast swaths of the population and implicitly sanctions the rule of markets as the ultimate authority in all matters social and environmental. In short, despite the fact that the cap-and-trade program ultimately does not function as a 'pure' market composed of conventionally understood commodities, the very moniker of market mechanisms cedes some degree of responsibility, and hence reward, from the public to the private, and the private is represented firmly by capital.

While this situation *may* be palatable in terms of outcomes for the state of California, it becomes dangerous when the policy is ported wholesale into other jurisdictions with low levels of transparency and accountability, as is the case with China, which is eagerly studying California's market with the explicit goal of borrowing directly from California's policy innovations. My preference, frankly, would be a must higher administratively determined carbon price coupled with much less flexible performance standards, quotas, and a state-wide reprioritization away from spending on regressive social measures like prisons to even higher, world-leading levels of public investment in climate mitigation measures. This barrier to production through a high cost of carbon could even be called a fee to avoid the current impossibility of creating new taxes in the state. Advocating for this type of policy measure would most certainly entail a politics of contestation, but the level of technical understanding required to write even these types of regulations would still require the enrollment of experts- the need for expertise is not in question, but the way in which it is deployed, and to what ends, should certainly be in play. Given the talent and dedication of the staff at the ARB, these types of rules are every bit as plausible as the creation of a carbon market, particularly if carbon markets are indeed best understood as administrative procedures with market-like characteristics.

Further issues for study in California climate policy

Barring an unlikely upswing in social movements that demand a shift away from the use of market-like measures for mitigating greenhouse gases, a legislative change of heart, or an unexpected court ruling that undoes cap-and-trade, there are

a number of issues that merit further examination. I will first explore empirical issues, and then move to consider concepts that could be developed.

Most obviously, a similar analysis to the one undertaken in this dissertation could be performed on California's compliance offset program. Many of the same actors are influential in the offsets space, with additional input from land managers, tribal governments, and even insurers that provide cover against the risk of offset invalidation. A study of the offsets program could trace how new offset protocols are created, a more in-depth understanding of the role of offset registries in building the capacities of offset project developers, the process of training offsets verifiers, and could include potentially illuminating field visits to actually existing offset projects. A thorough investigation of the offset part of the cap-and-trade program would provide additional insight into the question of value in regulatory carbon markets, where use and exchange value are still largely administratively determined, but require material interventions (the application of human labor) into the biophysical world. Precompliance offsets credits also appear to be subject to fewer restrictions on their trade, which may perform in unexpected, or thoroughly expected, ways. This would have to be investigated empirically. Finally, offsets have long been an area of interest to environmental justice advocates, not only because of the potential to prolong harmful pollution in low income neighborhoods, but because of their impacts on local residents of project sites. Most studies of offsets I am aware of have taken place in the Global South (e.g. Bumpus and Liverman 2009, Bumpus 2010, Lansing 2013), so an investigation of their physical manifestations in the heartland of the Global North could generate significant insights.

From a regional economic geography approach to California's cap-and-trade program, it would be helpful to analyze where and how CCA auction revenues are being spent. Two significant pieces of legislation (in addition to the budget) impact how and where cap-and-trade funds can be spent. Given that California brought in more than \$1 billion in sales from CCAs last year (Young 2015), there are no shortage of projects that will be funded by creating a barrier to production through cap-and-trade. This research could involve work with local jurisdictions and state agencies developing spending plans and how greenhouse gas emissions reductions from projects are quantified for proposal and then measured after implementation. It could also interface with community groups advocating for funds and ascertain what types of claims and projects are successful in garnering funding. Finally, it could investigate how influential the promise of cap-and-trade revenues have been in securing the support of environmental NGOs that were initially opposed to market mechanisms for achieving AB32 goal, but that are now in support of continuing the program.

From a policy perspective it might be most helpful to understand the role of multiple regulatory authorities and many complicated programs in the overall scheme of California climate policy. As mentioned throughout this dissertation, cap-and-trade is only one of a number of programs designed to deliver emissions reductions. While cap-and-trade will deliver the largest share of emissions reductions (CaliforniaCarbon.info n.d.), other programs, the Low Carbon Fuel Standard and Renewable Portfolio Standard in particular, will have a tremendous impact on the aggregate costs to polluters to reduce their climate footprint.

Compliance costs associated with these programs may be significantly higher than the carbon price associated with cap-and-trade, so calculating a comprehensive carbon price that can account for all associated programs would be an interesting exercise, particularly if not conducted by industry groups searching for the highest number possible. Further, while I have conducted this research predominantly from the perspective of the primary regulator, ARB, the California Public Utilities Commission and California Electricity Commission have had a significant role in the development of several key parts of the regulation. It would be interesting to conduct long term participant observation with those bodies to discern if there are different alliance or protocols that arise in different regulatory settings.

It would be fascinating to understand how California's climate change program fits into the puzzle of emerging climate mitigation policies across North America, or even globally. The United States Environmental Protection Agency is in the process of approving individual state action plans for the reduction of GHG emissions from power plants, and cap-and-trade is one of the mechanisms by which the agency has signaled states can fulfill their obligations. While it appears unlikely that many states will join California in attempting to impose an economy-wide cap, there could be some, like Washington, that will attempt to link into California's carbon market as was initially envisioned through the Western Climate Initiative.

Beyond a neat linkage wherein allowances become fungible between jurisdictions with radically different emissions geographies and histories of environmental regulation, it would be fascinating to see a comparative study on

California's cap-and-trade program and the Regional Greenhouse Gas Initiative (RGGI) that operates between 10 Northeastern and Atlantic US states that covers only power plant emissions. The number of jurisdictions necessarily creates challenges for harmonization of policy, and all the more so as other states potentially join in light of the above-mentioned new power plant emissions rules coming down from the federal government. The inclusion of new jurisdictions into existing carbon markets through linkage in California or in RGGI stimulates interesting questions of territorialization (becoming carbon-constrained), policy harmonization, and a potentially volatile situation wherein jurisdictions that are openly hostile to climate regulation but are forced to reduce emissions opt to join a carbon market as a 'least bad' solution.

Ultimately, the cap-and-trade program itself bears monitoring for future changes. This dissertation was written about conditions at a particular time in the development of the program immediately preceding and following the launch of the compliance program. This is no promise rules will stay as they are currently written, that financial innovations will be made to circumvent trading restrictions put in place by regulators, or that speculators will not overcome their caution about dealing in a financial product that exists purely through fiat. Were any of these conditions to emerge, it would require a reevaluation of whether calculative logics that are the hallmark of constrained marketization were allowed to flourish in the carbon space, particularly if they were to be accompanied by a significant rise in the exchange value of CCAs, triggering either the Allowance Price Containment Reserve, a political crisis of confidence in the program, or both. There are potentially endless

questions one could ask of the California cap-and-trade program but it seems to me these are the most pressing.

Other research projects to develop the conceptual framework

The conceptual strategy taken in this dissertation is to combine the strengths of political economy and performative approaches to the economy to achieve a greater understanding of regulatory environmental financial products. The application of this theoretical lens has led to improved understandings of the principles, practices, and actors that create these programs and what they do and do not do. Thus, it would be useful to apply this lens across a range of actually existing environmental financial products, both initiated by regulators and by private capital. Even since the beginning of my research on this topic, the number of regulatory carbon markets has grown dramatically worldwide, now stretching from China to Chile to Quebec. There are myriad other kinds of regulatory cap-and-trade like programs under development, such as the UK's biodiversity offsetting scheme and perhaps even a global carbon market under the auspices of the UN Framework Convention on Climate Change.

More interesting for me is the dramatic growth in non-regulatory mandated climate financial products, and climate bonds in particular. From the launch of the first climate bond in 2007, the asset class has grown to be worth more than \$50 billion in 2014. My future research into climate bonds will take a similar approach to my work on carbon trading programs, starting with accounting for the full range of actors and institutions involved in the fabrication and operation of climate bonds

in order to grapple with how risk, standards, and value are produced for climate bonds. While climate bonds originated with multilateral lenders like the World Bank, the types of institutions raising money through climate bond issuances now include municipalities like Spokane, Washington, and multinational corporations like Toyota. My future research will explore what makes climate bonds appealing to the banks that help issue and trade them, including many of the largest in the world, and explore how banks' involvement with climate bonds impacts other facets of their business, like financing oil exploration. Other actors in the climate bonds space include auditors that certify the green bonafides of bond offerings and the credit worthiness of each deal, and the buyers of climate bonds, particularly institutional investors, most notably public pension funds. I will investigate what makes climate bonds attractive to buyers, and the socio-spatial relations that are created by the tethering of states' capacities to pay pension obligations to projects across the world, much as they have been linked through catastrophe bonds (Johnson 2013), though with radically different political and ethical considerations.

An in-depth investigation of climate bonds is desperately needed, as there has been just three social scientific article published on the asset class, none of which take a heterodox economic approach (Matthews and Kidney 2010; Matthews et. Al 2010; Matthews and Kidney 2012). In addition to the empirical questions of how the climate bond market is growing and changing, I will apply a political economy plus performativity approach to investigate these bonds in terms of three issues. First, how is risk created, quantified, and managed in the green bonds market? Second, how are the standards by which climate bonds are certified and

priced and what are their effects? Finally, what types of values are created, appropriated, and circulated by the actors through climate bonds? This question includes economic value, but seeks a more expansive definition of value to include other valences as well.

Conceptually, my objective of a project on climate bonds would be to more formally forge a robust ontological and epistemological framework through which environmental-financial products can be understood as both performative and structural components of what Moore (2012) calls capitalist world ecology. The conceptual project will draw on political economy and performativity accounts of financialization while minimizing the blind spots of each. Historically, political-economic accounts have difficulty accounting for individual agency, technologies of measurement, and the sometimes-contradictory impulses of institutions. Conversely, actor-network approaches often have difficulty appreciating the potential fixity, and hence power, of institutions and also have a propensity to become enamored with complexity, failing to relate particular phenomena to broader processes, or to capitalism itself. The future research will draw on each of these perspectives' strengths, which are attuned to individual performances of models, metrics, and discourses, but relate that to a critical political economy of climate change.

The first aim this future research will accomplish is to understand the role of risk in the climate bond market. Risk in this project is polysemic, which is part of the reason that it is productive. For financiers purely chasing returns, financial risk can

be thought of as simply the possibility of losing money, or of not maximizing profits. Risk is increasingly seen as a, if not the, central organizing principle of financial capital, despite its relative neglect historically by political economists (Christophers 2014). However, risk is more than simply financial risk. Climate bonds are marketed as an attractive investment in part because of the attached social, environmental, and governance benefits they promise. Thus, there is significant risk that projects funded by climate bonds will not accomplish their environmental goals, which could become a substantial embarrassment for issuers, originators, and purchasers, not to mention the overarching risk of failing to mitigate climate change or adequately adapt to shifting environmental conditions.

The second aim of this potential research would be to explore the role of standards, both environmental and financial (and their interactions), that are applied to climate bonds. The two types of standards that are of particular interest are a) certification of the environmental potential of climate mitigation and adaptation projects and b) the credit rating of individual bonds. In order to understand the metrics and technical considerations in play in the making of standards, the project would have to include interviews with staff at Cicero, a certification body in Oslo that has served as the primary verifier for over 40% of climate bonds issued thus far, and with credit rating agencies that are responsible for determining the credit-worthiness, and hence rate of return, on new bonds. This question of credit ratings is of particular interest in light of the failure of the rating system in the run-up to the financial crisis. The comparison is particularly salient given the growth of derivatives in the climate bond market, ranging from bonds

whose pay out is tied to indices of questionable transparency to loans are bundled together in a practice that is quite similar to the fabrication of mortgage backed securities.

The third aim of this future research would be to further elucidate the notions of value present in climate bonds, as articulated in Chapter 5 in the case of the CCA. The project continues to draw inspiration from Graeber's (2003) typology of value regimes that may or may not be commensurable: moral value, economic value, and value as "meaningful difference", or the value imparted by semiotic definition or metrological regimes. From the perspective of Marxian political economy, this question is relatively straightforward – it is a question of understanding who is accumulating surplus value in the production and circulation of climate bonds. However, it becomes readily apparent from a cursory look at industry publications that while accumulation is an important motivation, it is not the only one (Climate Bonds Initiative n.d.). There is a moral dimension to the financialization of the atmosphere that may or may not be translatable into economic value. Finally, one can think of the third category, meaningful difference, as the metrological regimes, including standards but also encompassing definitions of the financial products themselves.

The primary scholarly audiences of this project are similar to that of this dissertation. These scholars can be found across a number of social science disciplines in what may be thought of as critical heterodox economics. The project will draw on, and contribute to, two primary literatures. The first set of literatures

are sub-disciplines of economic geography, most notably political ecology, financial geographies, and cultural economy. The second broad literature to which this project would contribute is science-and-technology studies, especially the social studies of finance and the sociology of markets. The reasons for working in these two literatures are several-fold. The overarching theoretical objective of this project is a synthesis of what can be broadly thought of as political economy and performativity approaches to environmental finance. While Christophers (2014) has signaled the ontological and epistemological possibility of just such a rapprochement, few studies have explicitly set out with this theoretical outlook as an objective. For simplicity, one could think of this theoretical project as a dialog between David Harvey (1973, 1982, 1989, 2003, 2008) and Michel Callon (1998a, 1998b, 2009; Çalışkan and Callon 2009, 2010). A more sophisticated framing asks how individuals and instructional arrangement *perform* the sundry activities require to construct and monetize climate bonds, the political economic consequences of such performances, and subsequent, recursive iterations of how individuals construct standards and institutions and then interact with them. The proposed research would allow me to observe these recursive effects on both the climate bonds universe itself, and shifting conceptualizations of each research aim: risk, standards, and value. For example, one might think of the tethering of the multiple understandings of risk embodied in a single climate bond, including the financial risk of default of the issuer or the underwriter, and the project risk that the interventions funded by the climate bond will not achieve its environmental objectives. How are each of these risks understood, quantified, and hedged against?

How are risks reconfigured based on growing experience with the asset class, and how do veterans of climate bond origination interact with risk differently than neophytes? Further, how are different kinds of risk framed in terms of their desirability by different actors? While institutional investors often prefer bonds because they are supposedly 'risk-free', which types of risk are they most concerned with minimizing- the financial or the environmental?

Topically, this project would be a contribution to scholarship on the financialization of nature. This emerging body of work includes Johnson (2010, 2014), Sullivan (2013, 2014), Dempsey (2013), and others who are currently conducting doctoral research on related topics can be thought of as an outgrowth of neoliberal nature's research programs undertaken by Bakker (2004, 2005), Robertson (2004, 2006, 2007), Swyngedouw (2005, 2007, 2010), Prudham (2001, 2007), amongst others. A sustained engagement with the climate bonds space would be a significant contribution to an improved collective understanding of what Smith (2009) described as 'nature as an accumulation strategy'.

By pursuing a research project on privately developed climate financial instruments and continuing to monitor the California carbon trading program, I hope to be able to create synthetic, comparative accounts of the ways in which climate change is becoming the object of financial management. This account will inform scholarship about the ways those financial products do or do not correspond to our understandings of the broader world of finance and their potential to contribute to a suite of mechanisms that can stave off the worst impacts of climate

change. While the magnitude of the challenges that climate change poses creates temptation to say that all options should be on the table, every single option requires careful consideration. Uncritically pursuing programs are that our collectively favored measures presents the risk that projects will not deliver the promised emissions reductions, which could lead us to need even deeper and more painful emissions reductions. Further, the dangers posed to the global economy by the periodic crises induce by financialization and the attendant instability that could undo any emissions reductions measures successfully created by those financial products. For these reasons, amongst others discussed throughout this dissertation, the tethering of finance to climate change mitigation should not be dismissed out of hand, but their potential significant impacts, or lack thereof, merit serious debate.

Appendix A: Sample Interview Protocol

1. What is your role in the cap-and-trade market?
2. When and how did you first become aware of the cap-and-trade market?
3. What were the key regulatory decisions that impacted your involvement in the cap-and-trade market?
4. What groups have been most effective in making their voices heard in regulatory hearings?
5. Are some types of meetings more effective than others in advancing particular positions in the rule-making process?
6. How significant are new firms, created specifically in response to AB32 and other market-based environmental regulation, in the operation of the market?
7. Can you identify a particular city or region where firms and people involved in the market have clustered?
8. Are there spaces outside of regulatory hearings that have been particularly effective in changing the potential function of the carbon market?
9. How much has the involvement of academic economists changed the design of the market?
10. What sorts of arguments have been most effective in changing the regulatory landscape of the carbon market?
11. Following the initial auction, what are your impressions of how the market is functioning?

Appendix B: Glossary of Acronyms

AB32: Assembly Bill 32, The California Global Warming Solutions Act of 2006

ACR: American Climate Registry

APCR: Allowance Price Containment Reserve

AQMD: Air Quality Management District

ARB: California Air Resources Board

ARBOC: Air Resources Board Offset Credit

Btu: British Thermal Unit

CAR: Climate Action Registry

CCA: California Carbon Allowance

CCO: California Offset Credit

CDM: Clean Development Mechanism of the Kyoto Protocol

CFC: Chlorofluorocarbon

CH₄: Methane

CITSS: Compliance Instrument Tracking System Service

CO₂: Carbon dioxide

COP: Council of Parties to the United Nations Framework Convention on Climate Change

CPI: Consumer Price Index

EAAC: Economic and Allowance Advisory Committee

EDF: Environmental Defense Fund

EF: Emissions Factor

EJ: Environmental Justice

EJAC: Environmental Justice Advisory Committee

EPA: Environmental Protection Agency. May refer to Federal or California.

eNGO: Environmental Non-Government Organization

ETS- Emissions Trading System

EUA: EU Emissions Allowance

EU-ETS: European Union Emissions Trading System

GDP: Gross Domestic Product

GHG: Greenhouse Gas

GWP: Global Warming Potential

ICE: Intercontinental Exchange

IETA: International Emissions Trading Association

IOU: Investor Owned Utility

IPCC: Intergovernmental Panel on Climate Change

JPA: Joint Powers Authority

MRR: Mandatory Reporting Rule

MSCG: Morgan Stanley Capital Group

MWD: Metropolitan Water District

MWh: Megawatt hour

NAICS: North American Industrial Classification System

NDRC: Natural Resource Defense Council

NGO: Non-governmental organization

NGS: Natural Gas Supplier

NYSE: New York Stock Exchange

OPO: Offset Project Operator

OTC: Over the Counter. A type financial transaction.

POU: Publicly Owned Utility

RECLAIM: Regional Clean Air Incentives Market

REDD+: Reducing Emissions from Deforestation and Degradation Plus.

RIN: Renewable Identification Number

ROC: Registry Offset Credit

SCPPA: Southern California Public Power Authority

tCO₂e: Ton of Carbon Dioxide Equivalent

TVA: Tennessee Valley Authority

VAE: Voluntary Associated Entity

VAT: Value Added Tax

WCI: Western Climate Initiative

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Curriculum Vitae

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Degrees Obtained to Date

Masters of Arts

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University of Kentucky

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2006-2009

Thesis: "Finding Neoliberalism in London, KY"

Advisor: Tad Mutersbaugh

Bachelor of Arts

Department of Geography

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2002-2005

Advisor: Sallie Marston

Professional Employment

2014-present. Graduate assistantship, University of Kentucky, Department of Geography.

2013-2014. National Science Foundation Doctoral Dissertation Research Improvement Grant.

2011-2013. Research associate, Kentucky Transportation Center.

2010-present. Instructor, Eastern Kentucky University, College of Justice Studies.

2009-2011. Graduate assistantship, University of Kentucky, Department of Geography.

2006-2008. Graduate assistantship, University of Kentucky, Department of Geography

Publications

Peer Reviewed Publications

Kappeler A and P Bigger 2011. Capital, Nature, Neighborhoods: 'Dispossession without Accumulation'? *Antipode* 43:4, 986-1011.

Book Chapters

Bigger P (forthcoming). Articulating fairness: The negotiation of carbon market design across axes of equity in California. In Palandino and Fiske (eds). *The Carbon Fix: Global Equity in the New Environmental Regime*. Walnut Creek, CA: Left Coast Press.

Samers M, P Bigger, and O Belcher 2014 (forthcoming). Changing the World: Geography, Political Activism, and Marxism. In Valentine G and S Aitken (eds). Key Approaches to Human Geography. London: Sage.

Digital Interventions

Bigger P 2013. What is REDD+ Getting itself into? Public Political Ecology Lab Forum on REDD+ Carbon Offsets. Available at <http://ppel.arizona.edu/blog/2013/03/14/what-redd-getting-itself>.

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Reviews

Bigger P 2013. Magdoff F and Foster JB 2011. Review of What Every Environmentalist Needs to Know about Capitalism. New York: Monthly Review Press. Capitalism, Nature, Socialism, 24:3, 249-251.

Bigger P and J Rossi 2012. Review of All Watched Over by Machines of Loving Grace. Dir Adam Curtis. British Broadcasting Corporation 2011. Television. Human Geography 5:1, 109-112.

Grabbatin B and P Bigger 2012. Peet R, M Watts, and P Robbins 2011. Global Political Ecology. New York: Routledge. Introduction to the review forum: Global Natures: From utter failures to the possible. Area 44:2, 259-260.

Bigger P 2012. Peet R, M Watts, and P Robbins 2011. Global Political Ecology. New York: Routledge. Contribution to review forum: Going global in global political ecology. Area 44:2, 262-264.

Awards and Honors

Participant in the Summer Institute for Economic Geography. Frankfurt, Germany. July 2014.

College of Arts and Sciences Outstanding Teacher Award. Awarded by University of Kentucky College of Arts and Sciences. April 2011. \$500.

Outstanding Geography Teacher Award. Awarded by University of Kentucky Geographical Society. April 2010.

Visiting Research Associate. Queens University, Belfast, Northern Ireland. Department of Geography. June 2007