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THE CULTURES OF MARKETS

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Janelle Knox-Hayes

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Preface

No ideology has been more predominant in the governance of global and national political economies over the last century than that of free-market capitalism. The free market gave rise to the industrial revolution, outlasted empires, and, with the end of the Cold War, reaffirmed its supremacy at the end of the twentieth century as *the* means to secure economic growth and prosperity. In this context, it comes as no surprise that the free market is now considered the answer to the gravest collective action problem humanity has ever faced: climate change. And yet, despite, or perhaps because of the success of the market ideology, there is reason to question the ability of markets to address climate change. First and foremost, how markets are transmitted across cultural space remains an open question. If markets are in fact an ideology, then scholars should expect them to take different forms in different places, in much the same way that a religion changes as it moves across cultural boundaries. For an issue that requires as much global coordination as climate change, these differences have the potential to create significant impediments to collective action. Second, markets gave rise to the problem in the first place. More than any other issue, climate change lies at the heart of the mismatch between the function of human social systems and natural systems. The mismatch fundamentally rests on the differentials between the speed with which human systems operate and those of natural systems. Thus, the fundamental issue is not the failure to price greenhouse gas emissions (although that is significant) but rather the increasing dynamism with which human systems operate in comparison to the relatively stable processes of the natural world.

This book sits at the intersection of the study of markets and climate governance and fulfills two aims. The first is to dissect the construction and evolution of markets, addressing questions of how markets function as an ideology and an institution of governance with the potential to address climate change. Here I explore the cultures (plural to acknowledge the variety of cultural forms that inform market governance) of markets and in the process challenge the notion that the free market is simply a system of exchange. To do so, I analyze the sociopolitical context of market development through case studies utilizing a unique dataset of 275 interviews with

market and policymakers gathered from extensive fieldwork in in the United States, Europe, and the Asia-Pacific (Appendix). Although each of these countries and regions has attempted to develop market-based systems of climate governance, the results have diverged significantly. Fundamentally, the variety observed in the cases arises from differences in beliefs about the proper scope and role of markets in the broader political economy, as well as in relation to environmental problems. In analyzing these dynamics, I highlight issues at the interface of political and economic governance, including citizen, state, and industry participation, as well as the ways in which markets reflect the legacy of sociopolitical context. Markets are ultimately institutions embedded in culture.

The second aim of the book is to analyze the role of markets as systems of climate governance. The market ideology suggests natural resources are best managed through the pricing and trading of positive and negative externalities. If successful, markets will not only be used to govern the greenhouse gases that generate climate change, but they will also introduce an era of environmental finance. To the extent that markets can overcome political barriers and serve to collectivize action and coordinate resource use across regions, they have the potential to create tremendous financial value from the governance of the natural environment. However, I argue that the markets ultimately have the potential to devalue and destabilize—rather than preserve—natural environmental systems. I highlight the problems of market governance, including the mismatch between the scale that the financial productivity of markets achieves and the material impacts they generate for natural resources.

Climate change is an unprecedented collective action problem, which requires a unified response. Solving climate change requires collaborative and international management of a range of socioeconomic processes that produce greenhouse gas emissions. For the better part of two decades, the path forward seemed to lie in achieving international consensus and supranational command and control regulation. Policymakers and scholars focused attention on solutions developed at the global scale such as international binding treaties (i.e. the Kyoto Protocol). The failure of countries to agree on a post-Kyoto framework at the critical Copenhagen Conference of Parties in 2009 shifted the focus away from global agreements. The non-binding, pledge and review nature of the Paris Accord of 2015 similarly reflects an emphasis on state-determined independent action. In particular, a number of countries have begun to develop domestic and regionally oriented emissions trading systems with only secondary attention to the possibility of global linkages. These regional initiatives have become an area of interest for both policymakers and scholars of climate governance.

The growing predominance of market-based mechanisms at the state and regional levels is significant and creates opportunities for scholarly inquiry for

a number of reasons. First, the markets raise issues of the basis of various forms of authority, particularly where and with whom the authority to address climate change is placed. Numerous scholars have addressed the issue of scientific authority and the way in which its acceptance or rejection influences the development of climate governance. However, another issue is the logic of economic-based authority, which is a point this book addresses directly. The logic of economic-based governance presents assumptions not only about the nature of the climate change problem, namely that it is an economic problem that can be best addressed through economic means, but also about the best way to govern access to resources. This book simultaneously reifies and challenges notions of economic-based authority by looking at the logics that underpin the creation of markets in different cultural contexts. On the one hand, countries express an inescapable logic of economic governance in establishing markets to control greenhouse gases. On the other hand, the variance in approach and ease or difficulty with which countries adapt market-based systems of governance highlight other logics and authorities that introduce tension into the sphere of governance.

At a broader level, there is a growing literature in the sociology of markets on the ways in which social elements can elucidate the form and function of markets. From conventional definitions in the discipline of economics, markets are understood to be economic devices, places of exchange and competition devoid of collective action. This perspective overlooks the equally important social components of markets that drive their function and development. Understanding the social complexities of markets might enable them to be better conceptualized as organizational processes, which bolster collective action. Analysis of the social aspects of carbon emissions markets lends itself not only to the study of processes of climate governance, but also to broader issues of market development. First, the carbon markets are being constructed in present time, which creates the opportunity to gather data on the insights and perspectives of the individuals engaged in building the markets. Second, the markets are reflective of a growing logic of financialization, and seek to address climate change by creating a financial impetus to reduce emissions. Rather than trade a tangible commodity, the markets trade the financial value of the absence of emissions. As a consequence, carbon markets lend themselves to the study of broader systems of financialization and their consequences.

Finally, analyzing the markets from the standpoint of international or regional development invariably raises the issue of culture and its role in shaping political economy. A growing literature addresses the issue of varieties of capitalism, and their various manifestations and implications. However, this literature has only recently begun to address varieties beyond the Anglo sphere, particularly beyond the scope of market-based capitalism in the

United States, and more institutional varieties in Europe. Asian capitalisms express different characteristics based both on underlying historical variations in institutional structure as well as variance in political and economic aspirations in the present. Additionally, culture (in the form of geography and history) is significant to the process of building markets. In analyzing the cultures of markets, it is possible to tease apart the underlying legacy of sociopolitical institutions and the ways in which these shape and are shaped by market development. The book investigates the tensions between the construction of 'best practice' markets modeled on existing institutions (particularly Western institutions), and institutional models that reflect and embrace underlying cultural norms.

Taken together, these threads and themes are manifest in the economic geography-based research strategy of the book as well as in the commitment to history and contextual political economy. I take the approach that markets are first and foremost social institutions. To understand the development of markets, it is necessary to understand the actors who build markets and the social contexts within which they operate. In studying the actors and processes through which markets are built, it is in turn possible to gain an understanding of the ways in which cultural and sociopolitical context influence the shape of markets.

The book is the product of an eight-year study that has analyzed the institutionalization of climate governance through emissions trading in six regional and country cases: Australia, China, Europe, Japan, South Korea, and the United States. Specifically, I gathered extensive data from expert interviews, surveys, and participant observation in each of these places. The focus of the book is on climate governance, and the analytical heart of the book lies in an analysis of carbon emissions markets. However, beyond addressing climate change, carbon markets are part of a larger agenda designed to demonstrate the efficacy of using market mechanisms to govern environmental resources. In this regard, carbon markets have the potential to initiate financial institutions designed to integrate the natural environment as a source of new financial instrumentation. The book therefore also sheds light on the growing role of finance in managing environmental resources through environmental finance.

To understand the initiation of the institutions of market-based climate governance, it is necessary to investigate both the actors and the organizational forms, including the cultural dynamics, which shape institutions. The foundation of the approach I take is the claim that markets as an ideology spread from points of origin rather than come into existence simultaneously. Thus the book traces the development of markets in time and space. I first explore the ways in which markets as institutions are created through an investigation of the early markets developed in the United States and Europe.

Here, I address the logics and mechanisms that are used to operationalize markets. Second, I analyze the transfer of environmental finance into the Asia-Pacific region to shed light on the movement of economic and financial traditions into different sociopolitical and economic contexts. A detailed understanding of the mechanisms of environmental finance is important to improve the function of these financial systems and to better inform the development of environmental policies like carbon trading.

Additionally, the research sheds light on both commonalities and differences in the structure and function of markets across cultural contexts. I have found that carbon markets are built to model existent financial markets. As such, they operate according to existing logics and are controlled by incumbent organizations and financial centers. The movements of the carbon markets into the Asia-Pacific region open new lines of inquiry into the impact of sociopolitical and cultural context on the development of markets and broader systems of governance. The question is of interest to the geopolitics of the region—which organizations and centers control which modes of finance—as well as to the operation of finance in general; environmental finance can either reinforce existing logics or seek to challenge them.

My approach is not motivated from the standpoint of a specific methodological or epistemological agenda. Nevertheless, I believe there is great potential for inductive theorizing and qualitative methods to add insight to our understanding of markets, and of economic geography in general. Indeed, an overwhelmingly quantitative focus in market and economic studies leads to a lack of understanding of the causal mechanisms underlying economic phenomena. The most potent remedy is more qualitative research that can examine causal forces and pathways. In particular, the case studies in the book are built from interviews and close dialogue with market makers in organizations such as banks, brokerages, exchanges, government agencies, legal firms, and NGOs. These techniques are used to capture the social aspects of markets including details of the market agency and the human forces that shape and enact the markets.

In sum, my approach is designed to acknowledge and embrace the significance of history and geography in political economy. I address the drivers of the production of market-based climate governance, the impact of cultural legacy on institutional transfer, and what this implies for climate and environmental governance in the coming decades. Additionally, by incorporating a consideration of spatial and temporal scale in the creation of market values, the book seeks to offer a significant and original contribution to three interdisciplinary literatures: time-space geography, the sociology of finance, and ecological economics. It extends the agenda and scope of recent work in these literatures by providing insight into the institutional development and

transfer of financial norms, services, and products across cultural boundaries, and mapping networks of market institutions.

While I refer to the approach presented in the following pages as 'my' approach, in truth I am only the majority shareholder. I owe a tremendous debt to a small army of people for their advice, support, and guidance, without whom this book would not exist—or if it did, it would be but a shadow of what is here. I am forever grateful to my husband Jarrod who has been a partner through every aspect of this project. He has been a sounding board for my ideas, my traveling companion and co-researcher, a source of emotional support, and a tremendous reviewer and editor of each of the chapters. Throughout the project I have had the support of tremendous mentors. Gordon Clark was present at the creation of this project and has been an amazing advisor and mentor, enduring a constant stream of emails, phone calls, and paper and chapter drafts over the past eight years. Shirley Clark has likewise been an enduring mentor and friend offering words of encouragement and a successful role model for the balancing of life and career. Jarrod and I both found many an hour of solace working in Gordon and Shirley's allotment garden in the Oxford countryside.

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BOCM	Bilateral Offset Credit Mechanism (Japan)
CARB	California Air Resources Board
CCAR	California Climate Action Registry
CCER	Chinese Certified Emissions Reduction
CCP	Chinese Communist Party
CDM	Clean Development Mechanism
CDM EB	CDM Executive Board
CDP	Carbon Disclosure Project
CER	Certified Emissions Reduction
CH_4	Methane
CO_2	Carbon Dioxide
COP	Conference of the Parties
CP	Carbon Principles
CPRS	Carbon Pollution Reduction Scheme (Australia)
CSR	Corporate Social Responsibility
C40	C40 Cities Climate Leadership Group
DOE	Designated Operational Entity
DRC	Development and Reform Commission (China)
EPA	Environmental Protection Agency
EPW	Senate Committee on Environment and Public Works (USA)
ETS	Emission Trading System
EU ETS	European Union Emissions Trading System
EU	European Union
EUA	European Union Allowance
FSC	Forest Stewardship Council
FYP	Five Year Plan (China)
GDP	Gross Domestic Product

GIR	Greenhouse Gas Inventory and Research Center (South Korea)
HFCs	Hydrofluorocarbons
INDCs	Intended Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change
IT	Information Technology
ITL	International Transaction Log
JCM	Joint Crediting Mechanism (Japan)
JI	Joint Implementation
JPAs	Japanese Emissions Allowances
JVETS	Japanese Voluntary Emissions Trading Scheme
KEMCO	Korea Energy Management Corporation
KCUs	Korean Credit Units
KECO	Korean Environment Corporation
KETS	Korean Emissions Trading System
METI	Ministry of Economy, Trade and Industry (Japan)
MOE	Ministry of Environment
MOSF	Ministry of Strategy and Finance (South Korea)
MOTIE	Ministry of Trade, Industry and Energy (South Korea)
MRV	Monitoring, Reporting, and Verifying
N_2O	Nitrous Oxide
NDRC	National Development and Reform Commission (China)
NGO	Non-Governmental Organization
NO_x	Nitrogen Oxides
OECD	Organization for Economic Cooperation and Development
PAT	Perform, Achieve and Trade Program (India)
PFCs	Perfluorocarbons
PDD	Project Design Document
PRC	People's Republic of China
REDD	Reducing Emissions from Deforestation and Degradation
RGGI	Regional Greenhouse Gas Initiative
RMB	Renminbi (Currency of China)
SF_6	Sulfur Hexafluoride
SO_2	Sulfur Dioxide
SO_x	Sulfur Oxides
tCO_2e	Tonne Carbon Dioxide equivalent

UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
US	United States
VAP	Voluntary Action Plan

Part I

The Political Economy of Climate Governance

1

Introduction

Confronting Climate Change

1.1 The Nature of the Problem

The idea of climate change is simple enough. Greenhouse gases (primarily carbon dioxide (CO_2), but also others such as methane and hydrofluorocarbons) are emitted by industrial activity, mainly through the burning of fossil fuels such as coal, gas, and oil. These fuels are the remnants of old forests and are comprised of hydrocarbons. The burning of the fuels releases carbon dioxide into the atmosphere. The atmosphere thermoregulates the planet—trapping some heat while allowing the rest to radiate back to space. Central to this function are the greenhouse gases, molecules that absorb and reradiate infrared (thermal) radiation rather than allow it to escape into space.[1] As the concentration of greenhouse gases increases the amount of trapped heat grows, which over time leads to a net increase in temperature at the earth's surface (Meinshausen et al., 2009). The core components of the problem then are industrial and economic processes that emit greenhouse gases, shifting atmospheric chemistry as greenhouse gas concentrations increase, and rising global temperatures. As the average global temperature increases, a host of climatic changes occur: glaciers melt, sea levels rise, and weather patterns change.

The solution is also seemingly simple: prevent greenhouse gases from being emitted into the atmosphere to avoid altering atmospheric chemistry and the ensuing climactic effects. However, as the repeated failure of global climate negotiations suggests, the apparently simple solution presents substantial

[1] The planet Venus provides an extreme example of the effect of high greenhouse gas concentrations: more than 96% of the Venusian atmosphere is composed of CO_2 and as a consequence the average surface temperature is over 860° Fahrenheit or more than 460° Celsius, making Venus the hottest planet in the solar system (more so than Mercury despite the latter's near proximity to the Sun).

complexity. First, scientists must calculate historic and present greenhouse gas concentrations, forecast future greenhouse gas emissions levels, and accurately model the effects of these concentrations to create estimations of how much carbon dioxide in the atmosphere is tolerable. Second, carbon dioxide is a negative externality—a public detriment that is not accounted for in the economic transactions that produce it. Thus, CO_2 emissions are unrestrained because emitters do not have to pay the cost of releasing it into the atmosphere.[2] Understood in this way, the key to managing carbon emissions is to internalize them in economic transactions. Internalizing the cost of carbon emissions requires both a political solution, the creation of regulation to mandate the reduction of CO_2 emissions, and an economic solution, the construction of a priced carbon externality and an economic infrastructure that can exchange and transmit the value of the priced carbon externality. The challenge is that nearly the entire energy infrastructure underpinning the modern political economy emits carbon dioxide.

Given the economic origins of the problem, it was perhaps inevitable that the solution to climate change would be to create a market mechanism to govern greenhouse gas emissions. The apparent simplicity of both the problem and solution is belied by the obvious difficulties states and societies have had addressing climate change. For one thing, climate change is a spatial and temporal macro problem, operating at a global scale and over a long-term horizon. Because climate is structural and systemic, people do not experience the climate so much as they experience weather, which is local and changes hourly or daily and thus apparently belies claims of general trends. The mismatch in temporal and spatial scale creates a problem of felt impact. Over decades and at a global scale temperature will rise and climate patterns will shift, but the weather at a local level is variable and relatively unpredictable. The apparent disconnect between abstract claims about the climate and the concrete experience of weather can help drive skepticism as to whether or not climate change exists and is anthropogenic.

Furthermore, there is a dislocation of scale between intervention and impact. Carbon is one of the most abundant elements on earth, and the building block for all organic material. It is released by virtually every sector of every economy on the globe. Combatting climate change therefore requires changing the daily activities, particularly energy use, of literally billions of

[2] The 2006 Stern Review (Stern et al., 2006), the most comprehensive study of the economic costs of climate change to date, estimates that effects of climate change (weather-driven economic disruptions, migration, wildfires, shifting crop cultivation, water availability, and so on) will cost the globe *at least* 5% of annual global GDP, which grows to 20% if a wider range of risks and impacts is included. To put these numbers in context, according to the World Bank (2014), 2014 global GDP was roughly $77.8 trillion (at 2014 US dollar values). Thus, in 2014 according to the Stern estimate, carbon polluters of all kinds enjoyed private economic benefits worth at least $3.89 trillion, or roughly the size of Germany's 2014 GDP, fourth largest in the world.

people. Yet, the benefits of these changes will only be experienced over the course of decades or perhaps centuries. Individuals discount the future, and can be particularly averse to making short-term private sacrifices for long-term collective benefits (Quiggin, 2008). Combatting climate change thus requires a system of governance that permeates individual action and yet operates on a global scale, with net benefits that cannot easily be perceived by individuals.

The complexity of the problem of climate change therefore requires that governance be translated across time and across global and local scale. Climate change is a scientific, political, and economic phenomenon. Reponses to it are also very much a normative issue, woven from individual to collective goals and values. Even if we assume that the solution is straightforward—create the absence of CO_2 as a commodity and build a market mechanism to price and reduce greenhouse gases—the reality of such a challenge is complex. To be effective carbon governance must operate at a global scale, and yet the sovereignty to create markets to reduce greenhouse gases rests with each country (or even subunits within a country) and they must establish their own systems for distributing costs and mechanisms for enforcing compliance. Within the construction of market mechanisms there are complex decisions that have to be made to structure the value of the commodity, distribute ownership, and establish a system of exchange. Each country confronts the challenge of achieving sufficient political buy in, with critical questions of who has the authority to make governance decisions, and who will ultimately bear the cost of reducing emissions. The greatest challenge to date has been getting consensus and concerted action from some of the largest emitters, including the United States, China, and India.

1.2 The Formation of Climate Policy around Emissions Markets

To understand the structure and development of carbon markets across multiple geographies, it is helpful to situate them in the context of the global climate policy discussion. Scientific studies linking increases in greenhouse gases to planetary warming have been around for over a century (Arrhenius, 1896; Tyndall, 1959). However, it was not until the early 1990s that climate change became a recognized international issue, with the formation of two intergovernmental bodies: the Intergovernmental Panel on Climate Change (IPCC) and the United Nations Framework Convention on Climate Change (UNFCCC).

1.2.1 *Intergovernmental Panel on Climate Change*

While the science of climate change has been long established, it was consolidated politically in 1990 with the formation of the IPCC. The United Nations

Environment Program (UNEP) and the World Meteorological Organization established the IPCC to provide a clear scientific view of the current state of knowledge on climate change and its potential environmental and socioeconomic impacts. The IPCC is comprised of an international body of more than 3,000 climate scientists who collaborate to review and assess the most recent scientific, technical, and socioeconomic findings relevant to climate change (Intergovernmental Panel on Climate Change, 2015). This ongoing review is released periodically as assessment reports summarizing the impacts, adaptation, vulnerability, and mitigation of climate change. These reports include estimates of historic and current levels of CO_2 concentrations and predict future climate changes (global temperature change, sea level rise) based on anticipated levels of increased atmospheric concentrations of CO_2.

As a scientific and intergovernmental body, the IPCC is intended to be policy relevant but not policy prescriptive. Nevertheless, the estimations and predictions of the scientists who generate the assessment reports (as well as special reports prepared specifically for the UNFCCC) are taken into account and used to establish baselines or target levels of CO_2 in UNFCCC negotiations. For example, the IPCC Second Assessment Report of 1995 provided important information for establishing baselines and targets in the run-up to the 1997 Kyoto Protocol. The IPCC plays an important role in incorporating scientific knowledge and scientific authority into the governance of climate change.

1.2.2 *United Nations Framework Convention on Climate Change*

The UNFCCC is an international environmental treaty that was negotiated at the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992. The objective of the treaty is the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (United Nations, 1992, Article 2). The UNFCCC Secretariat is tasked with the organizational implementation of the treaty, which establishes the conventions of carbon reduction at the international level. The treaty provides a framework through which parties can negotiate binding international treaties (or protocols) to limit greenhouse gas emissions.

Since 1995 the parties to the convention have met annually in a Conference of the Parties (COP) to assess progress in dealing with climate change and to negotiate the treaties. There are 195 parties to the Convention, which are divided into two categories, Annex I (developed nations) and non-Annex I (developing nations). The distinction was designed to recognize common but differentiated responsibilities. Under the UNFCCC, Annex I countries would initially have binding targets, since in 1992 they were considered to have contributed the most to climate change through 150 years of

industrialized activity, and were most capable of absorbing the costs necessary to prevent catastrophic climate change. Over time the distinction has become strained as India and China (both non-Annex I countries) have grown in terms of wealth and carbon emissions. Notably, in 2014, China was reported to have exceeded the European Union (EU) in per capita emissions after surpassing the US in overall emissions in 2007 (Nicola, 2014).

In 1997 the third COP adopted the Kyoto Protocol as the first treaty to establish legally binding obligations on greenhouse gas emissions. Due to a complex ratification process, it did not enter into force until February 16, 2005. The Kyoto Protocol operationalizes the UNFCCC and has been ratified by every Annex I party except the US. It set binding emissions targets for the ratifying Annex I countries with the objective of achieving an average 5 percent emissions reduction compared to 1990 levels over the five-year period from 2008 to 2012. This originally was the only planned commitment period, with subsequent reductions to be negotiated under a follow-up treaty. However, with the failure to negotiate a replacement treaty at the critical 2009 COP in Copenhagen, the Kyoto Protocol was extended during the 2011 COP in Durban for a second period, which runs from 2012 until 2020. This agreement preserves the international legal system established under Kyoto—including Annex distinctions, accounting rules, and models of international cooperation—with the hope that a second binding treaty will be agreed in time to establish mechanisms of reduction after 2020. Although non-binding, the Paris Accord agreed at the COP in Paris 2015 goes some way towards creating a new framework of target setting and review among all participating countries. In addition, it has changed the Annex I/Annex II distinction into a "shared responsibilities" approach through which all countries participate in setting Intended Nationally Determined Contributions (INDCs). The INDCs specify how each country intends to contribute to greenhouse gas reductions post 2020.

In line with the idea that climate change can best be governed by internalizing greenhouse gas emissions as an unaccounted externality, the Kyoto Protocol did two critical things. First, in placing quantitative limits on greenhouse gas emissions, it established a market price for their absence from the atmosphere and created the carbon credit as a commodity. Second, it established the basic infrastructure of a market system for the trade of carbon credits in the form of three mechanisms: emissions trading, the Clean Development Mechanism (CDM), and Joint Implementation (JI).

Emissions trading was designed to facilitate the creation of carbon reductions through commoditization, and to allow the burden of carbon reduction to flow to the places and economic sectors of greatest cost efficiency. Countries with excess emissions credits may sell them to countries in need of credits to meet their targets. Additionally, the Kyoto Protocol encouraged the

establishment of domestic cap and trade systems to allow countries to meet domestic targets. This market-based approach to environmental governance stood in contrast to more traditional approaches to environmental management, including taxes to control the price on greenhouse gas emissions or command and control regulation to specify energy use and efficiency parameters. Unlike taxes or cap and trade, which are incentives-based regulations, command and control regulations take a form (ambient standards, source-specific emissions limits, or technology requirements) that is much less flexible (Anderson and Lohof, 1997). For example, the EPA might set a performance standard, which establishes a fixed emission level for each polluter. While command and control approaches may be more effective at reducing emissions, they restrict the flexibility of the economic system—the burden of reducing emissions cannot be shifted to the firms that can achieve reductions more cheaply.

The Clean Development Mechanism (CDM) was designed to incorporate the participation of Non-Annex I countries by allowing for the creation of emissions reduction projects in those countries, which could be used to generate offset credits (based on the principle that an emissions reduction anywhere is an emissions reduction everywhere) for exchange with carbon credits in Annex 1 countries. Similar to the CDM, Joint-Implementation (JI) allows an Annex I member state of the Kyoto Protocol to establish an emissions reduction project in another Annex I member state. The mechanism was designed to provide another alternative to reducing emissions domestically, particularly to allow emissions reductions to be achieved in states where the reduction would be cheaper, such as Baltic and some Eastern European states.

1.2.3 *Emissions Trading*

Since the Kyoto Protocol came into force in 2005, a number of regulated and a smaller number of voluntary carbon markets (also referred to as emissions markets or cap and trade systems) have been set up around the world aiming to achieve CO_2 emission reductions, largely through cap and trade mechanisms. The most notable of the regulated markets is the European Union Emissions Trading Scheme (EU ETS), but regulated markets have also been created in Australia (subsequently canceled), China, Japan, New Zealand, and South Korea. Trial emissions markets are being established in a range of countries including Brazil, Chile, Mexico Indonesia, and Thailand (Kossoy et al., 2014).

Each regulated emissions market is structured with its own unique rules and procedures, but all cap and trade carbon markets operate in a similar way. Regulators or market authorities in each system place a cap on the amount of carbon or CO_2 equivalent gas that can be emitted by various greenhouse gas emitters. If the carbon emitted by a capped entity exceeds its cap, the entity

must purchase credits to offset its excess emissions. Entities that do not reach their cap can sell excess permits as credits onto the carbon market. In theory, the cap is ratcheted down over time, and emitters either become more efficient or go out of business because of higher costs. Either way, the system should reduce the total amount of emissions as well as send a price signal through the markets that benefits carbon-alternative fuel sources and technologies. Much of the challenge and uncertainty of the markets resides in the details of the design as well as the enforcement of rules (Lohmann, 2009). Central to these challenges is the constructed nature of carbon credits as inverse commodities, which value the absence rather than the existence of greenhouse gases (Knox-Hayes, 2010b).

Carbon markets generally trade two main types of credits: allowances and offsets (A. Michaelowa, 2004). Both products, which are measured in units of tonne carbon dioxide equivalent (tCO_2e), are constructed purely from information. Allowances are essentially permits that allow regulated entities to emit an amount of greenhouse gases. Symbolic of their absence, allowances can be used to cancel emissions under a cap. For example, if a company is allocated 200,000 tCO_2e and only emits 190,000 tonnes, it can sell the remaining 10,000 absent (never emitted) tonnes back on the market in the form of carbon credits.

Offsets serve as reduction credits and indicate the absence of an emissions occurrence in a location. Crucially, the materiality of the offset lies in the counterfactual: the offset is derived from a claim that emissions would have otherwise been emitted. For example, a company from Germany could build a wind farm in China and argue that if the wind farm *had not been* built, a thermal power plant that generates 200,000 tCO_2e annually *would have been* built in its place. As a consequence the wind farm has arguably reduced emissions by 200,000 tonnes, and once verified can sell these on to the market in the form of carbon credits (Bansal and Knox-Hayes, 2013). The counterfactual absence embodied in the offset then can be transferred to another location to allow for emissions there.

Both allowances and absences are constructed through a system of measurement that creates baselines or projection scenarios of the levels of greenhouse gas emission that would occur without intervention. As such, the reality of emissions reduction through carbon markets cannot be proven, only presented through arguments of "additionality" (greenhouse gas reductions over and above those that would have occurred) both internal and external to each system (Mason and Plantinga, 2013).

1.2.4 *Clean Development Mechanism*

The CDM allows countries with emission-reduction commitments (Annex 1 parties) under the Kyoto Protocol to offset some of their emissions from the

development of emissions reductions projects in developing countries. The projects might involve a rural electrification project using solar panels or the installation of more energy-efficient boilers. The output of CDM projects is a Certified Emission Reduction (CER), a unit of greenhouse gas reduction that has been certified by an independent auditor. As with other carbon credits, CERs are measured in emissions reduction equivalent to one tonne of carbon dioxide. The CDM Executive Board oversees the mechanism, and credits are issued through a CDM registry that is linked to national registries so that credits can be exchanged internationally. The CDM was the first international environmental credit scheme of its kind and provides a standardized emissions offset credit. It also established a host of protocols through which offset projects operate. However, the rules and procedures of CDM accounting of emissions reductions have also generated controversy (Bakker et al., 2011).

One of the core facets of the program is the concept of additionality. CDM projects can only be registered if they make a plausible case that the emissions reductions generated by the project are additional to what would have otherwise occurred and that without CDM financing the project would not otherwise be developed. For example, the construction of a wind farm in Indonesia would generate offset credits based on the argument that, if the wind farm were not built, a coal-fired power plant would be built to provide the comparable amount of energy. Under a second condition of additionality, the project owners have to build a case that without the revenue generated from the sale of CERs from the project, the wind farm would not be built. Once registered, the project would produce offset credits equivalent to the amount of emissions a conventional coal-fired power plant would generate (for a more comprehensive overview of the process of CER generation see Bansal and Knox-Hayes, 2013). The challenge with additionality lies in its counterfactual nature—it is impossible to demonstrate what would have otherwise happened. A plausible case can be made, but in the end the credits are measured relative to a reality that never comes to pass. As will be explored in subsequent chapters, this principle is very important because it allows for the construction of the inverse or absent commodity (the valued absence of something) and it sets a precedent for the commodification and exchange of a host of other environmental goods and services.

Until 2012 the CDM was the primary international market for offset trading, and was central in establishing a global market for greenhouse gas emissions (Kossoy et al., 2014). With the uncertainty surrounding a successor to the Kyoto Protocol, the CDM has diminished in importance, and is now largely shaped by the main source of demand for offset credits, the EU ETS. As a result, the CDM reflects the policies of the EU toward climate change. For example, before 2012 the largest CDM host country was China. However, the post-2012 EU ETS (now in its third phase) will only accept CDM credits