

UC Berkeley

UC Berkeley Electronic Theses and Dissertations

Title

Seeing Green: Speculative Urbanism in the Green Economy

Permalink

<https://escholarship.org/uc/item/33k4k2j8>

Author

Knuth, Sarah

Publication Date

2014

Peer reviewed|Thesis/dissertation

Seeing Green: Speculative Urbanism in the Green Economy

By

Sarah Elisabeth Knuth

A dissertation submitted in partial satisfaction of the

requirements for the degree of

Doctor of Philosophy

in

Geography

in the

Graduate Division

of the

University of California, Berkeley

Committee in charge:

Professor Richard Walker, Chair

Professor Dan Kammen

Professor Paul Groth

Professor Nathan Sayre

Spring 2014

©Copyright 2014

Sarah Elisabeth Knuth

Abstract

Seeing Green: Speculative Urbanism in the Green Economy

By

Sarah Elisabeth Knuth

Doctor of Philosophy in Geography

University of California, Berkeley

Professor Richard Walker, Chair

As the twenty-first century begins, climate change has become an urban problem. Global urban networks and institutions such as the World Bank point to cities' energy demand and major greenhouse gas emissions share. Simultaneously, they frame cities as a critical source of environmental solutions, through green building, energy efficiency retrofitting, "smart" infrastructure, and other transformations of twentieth century urban geography. And critically, they argue that innovative cities can make these changes *profitable*, and thereby help propel a technological revolution in advanced capitalism: the development of a "green" economy. Amidst the economic turmoil that followed the 2008 financial collapse, many public and private institutions took up the idea of green economic development as a pathway to economic recovery and twenty-first century accumulation.

In this study, I critically examine the crisis-era development of green economic ideas in the United States, particularly in cities like San Francisco. I focus on new forms of value and unconventional resources being developed for the green economy, from energy efficiency to the "green-ness" of buildings. I examine how the federal government and cities hope to harness this value for transformative economic development, and how financial institutions and real estate developers are pioneering distinct visions of the profits to be made from environmental change and/or its mitigation. Critical resource geography and political economy/ecology offer important theoretical windows into green economic development. I consider how critiques of market environmentalism developed to analyze rural resource extraction can be expanded to analyze a new urban resource geography. I use methods such as surveys of industry and policy literature, participant observation at conferences, historical research, and analysis of financial instruments.

I find that financial institutions and major real estate developers have become driving players in urban greening, even as green collar jobs organizers won governmental support for more economically redistributive visions. Finance is helping transform green building and retrofitting from a niche sector into mainstream real estate and urban development practice, aided by new "green" financial instruments. Simultaneously, financialization threatens to make green urbanism increasingly speculative and exclusionary, and delimits more ambitious federal programs to promote green manufacturing and mass employment.

Table of Contents

Introduction.....	1
Chapter 1: Seeing Green in San Francisco: Cities and/as Resource Geography.....	12
Chapter 2: Resource Geographies in a Green Economy.....	41
Chapter 3: Making Energy Efficiency a Resource.....	58
Chapter 4: Green IT and the Problem of “Post-Material” Resources.....	84
Chapter 5: Making Green Real Estate Markets.....	102
Chapter 6: New Resources, The State, and Finance.....	123
Chapter 7: Financialization and a Green New Deal?.....	139
Chapter 8: Urban Greening and Fiscal Financialization.....	159
Conclusion.....	178

Introduction

Residents of cities are responsible for as much as 80% of global greenhouse gas emissions while at the same time residents of cities are facing significant impacts from climate change...well managed, well designed, dense cities are also the only way to meet GHG emission mitigation targets, while providing an acceptable quality of life for the soon-to-be 6.5 billion urban residents.

- World Bank (2010)¹

Larger cities have a ravenous appetite for energy, consuming 2/3 of the world's energy and creating over 70% of global CO2 emissions...but, in the heart of the city lies an opportunity...We believe that a better global future lies in urban innovation and action. As the majority of future humans will live in cities, it just makes sense that our solution to climate change will reside there too.

- C40 Cities (2012)²

In the late 2000s, climate change became an urban problem. Talk of greening and resilience became inescapable in major cities worldwide, and urban questions increasingly preoccupied international climate forums. Urban organizing efforts like the C40 Cities Climate Leadership Group and the Clinton Climate Initiative grew rapidly and joined forces. The World Bank, United Nations Human Settlements Programme, UN Environment Programme, Organisation for Economic Co-operation and Development, and Rockefeller Foundation all initiated major urban climate programs and partnerships.³ As seen in the quotations above and many similar statements, globally powerful institutions put forward variations on a common argument: that cities are responsible for the bulk of world greenhouse gas emissions, that cities and urban populations are highly at risk from climate change, and that urban economic and political innovation is the key to solving both problems.⁴

What is new today is not the environmental and emissions significance of cities: urbanization, industrialization, mounting fossil fuel use, and large-scale landscape change have been closely interlinked for the past two centuries.⁵ Neither is it recognition of these connections. Modern environmentalism is deeply rooted in disquiet about the cities that industrial capitalism has built. Political movements over the last 150 years have organized against these cities' explosive, seemingly unplanned bursts of growth and crisis, their smoke and disease, and their transformations of vast regional hinterlands of resource extraction and waste disposal. What is new today is not even a realization that major cities have deepening *global* environmental geographies. As many voices took up concepts of globalization, global environmental change, and sustainability in the 1990s, UN-Habitat and other international development organizations began to include sustainable urban development in their mandates. Activist mayors and administrations signed their cities on to transnational urban initiatives like Local Agenda 21 and the International Council for Local Environmental Initiatives (now ICLEI-Local Governments for Sustainability). By the late 1990s, a tightening focus on global climate change and fossil energy consumption had prompted these cities to start producing urban emissions inventories and climate plans. This rescaling marked a major conceptual departure for a problem that had previously been represented in national level emissions figures and global or regional impact projections.

What is novel now is, first, the mainstream uptake of these urban visions of climate change response. Influential urban institutions are making climate change a core concern, and throwing more money into the problem via initiatives like C40 Cities. Second, and even more critically, these powerful players are reframing climate change action as an opportunity rather than a burden, and specifically an opportunity for *cities*. Using neoliberal ideas of market-based environmental regulation, they argue that environmental costs can, with the right tools and shifts in perception, be transmuted into radically new kinds of resources. From mitigating the bad to cultivating the good and useful, it is all to be a matter of perspective. They argue further that the new sources of value and kinds of private property created by environmental markets can drive globally beneficial technological innovation and urban economic growth. Introducing framings like the “green economy,” they aim to push these ecological modernist visions and resource geographies into the heart of urban and industrial economic processes. This re-centering represents a geographic expansion for schemes that have been most often rolled out in rural resource peripheries. Simultaneously, they promise that green economic leadership can help cities address other twenty first century challenges: namely, attracting investment and maintaining urban growth in an increasingly turbulent and competitive global economic system.

In the financial turmoil of the late 2000s, visions of green economic development have proven attractive to many urban and national governments worldwide, as well as private sector actors. Major cities now vying for the mantle of leadership in green development have advanced strategies that range from pioneering green architecture to retrofitting buildings for energy efficiency, constructing low-carbon infrastructure, and incubating clean technology development clusters. National governments have simultaneously enlisted cities as delivery mechanisms for green collar employment programs and for the development of national networks of cleantech innovation. Meanwhile, these unfolding policies are being watched eagerly by prospective private sector “partners” such as green design professionals and energy service companies, cleantech ventures, real estate developers, and, critically, financiers. These diverse and growing interests are advancing their own visions of urban greening as a groundbreaking economic opportunity, and a critical frontier in a drive to make global environmental change work for private capital accumulation.

This efflorescence of green economic activity demands immediate critical attention: so far, it has vastly outpaced scholarly attempts to track it empirically, let alone to interpret what it might mean. Political ecologists and other critical scholars have identified deep problems in more established areas of neoliberal conservation and resource management policy. They have blasted market-based environmental initiatives like wetland trading, forest carbon offsets, and the privatization of fisheries and other commons. They argue that these policies represent, variously, thinly disguised attacks on preexisting environmental regulations, inadequate environmental policies in their own right, and more or less disingenuous justifications for rural land and resource grabs.⁶ Contemporary urban visions of green economic development do not stand apart from these schemes and their troubles: in places like California, today’s urbanization of climate change policy is bound up in efforts to price and trade carbon dioxide and other greenhouse gas emissions. Scholars have critiqued these schemes of environmental enclosure and commodification along similar lines as more conventional privatizations of

land and resources justified in the name of environmental conservation.⁷ However, today's wave of urban green economic activity cannot be reduced to an ephemeral product of carbon market speculation. As this research will explore, more is happening on the ground in sectors like cleantech and real estate development than such a critique would suggest, and happening even in places without binding emissions caps and greenhouse gas pricing.

Understanding the actually existing green economy as it develops will require detailed examination of processes developing in particular places and sectors. I take up this approach in this study, situating the research in US cities and the national urban context in the aftermath of the 2008 financial collapse. I ask 1) what new sources of value and unconventional resources are being envisioned to drive emerging urban environmental markets, and by whom, 2) how these visions are being materialized; 3) with what emerging contradictions, and 4) with what potential implications for both environmental commitments and social welfare. Both successes and failures are important. For example, as can be seen in the aftermath of abortive carbon offset schemes and in the collapse of subprime mortgage markets, nominal failures and general losses can translate into opportunities for a privileged few.⁸ This possibility is especially live when the financial industry is involved, as it is increasingly with urban greening. To get at these broader interpretive questions, I further ask 5) how governmental entities, at the urban level and above, and financial players are producing these resource geographies, 6) for what purposes, and 7) in what kind of relationships. As two leading "brains" of capital self-tasked to expand this kind of frontier field of economic development, finance and the state have long careened between mutual dependence and exploitation, and are entangled in increasingly complex ways. They have often functionally diverged on areas of basic significance for the character of green economic development, including the relative patience of their investment and their basic environmental and social welfare mandates, or lack thereof.

I focus particularly on urban built environments and interior spaces as an object of the urbanization of climate policy, and as a target for schemes of resource discovery and environmental market development. This lens means examining real estate development, construction, retrofitting, and redevelopment; schemes to alter habitual behavior within workplaces and homes; the design and manufacturing of building materials; the production of new kinds of information technology; and the design of certain types of urban infrastructure. Notably, this focus sidelines projects such as alternative transportation and renewable energy, fields of urban greening and green economic development that demand more research. Specifically, I examine energy efficiency in the built environment, particularly large-scale energy efficiency retrofits, the production of "smart" information technology and infrastructure meant to lower everyday energy consumption, and "green" building in the most general sense. These sectors have been central to the urban greening visions proposed by C40 Cities, the World Bank, and other important institutions. Each of these fields of action proposes to create and capture a new kind of environmental value, discovering a novel resource that can be profitably cultivated in or extracted from urban built environments. Each is also being harnessed to generate experimental financial instruments and markets. To examine these developments, I have used methods including participant observation in technical

conferences and workshops; historical research; and analysis of trade literature, government policies, and particular financial instruments.

The actors driving these valuation and market creation processes are diverse. They range from real estate developers to high tech boosters to energy utility companies.⁹ The players who come up most consistently in this study are financial institutions and the federal government, at multiple scales. In the second part of the study, I consider the state-financial role and relationship more directly, asking how these players are working to create new kinds of resources that derive value from environmental regulation and environmental change, attempting to make use of these unconventional resources, and clashing with each other. I discuss the ongoing importance of national states in creating and securing new resources of the type and at the scale envisioned by proponents of a green economy, and how financialization has compromised governments' ability to play that role. In a concrete explication of tensions developing between finance and the state, I argue that financial players and major real estate developers have become major forces in urban greening in the United States and are influentially defining a distinct version of green – even as green collar jobs organizers and governmental rhetoric put forward more economically redistributive visions. Financial institutions are helping transform green building and retrofitting from a niche sector into mainstream real estate and urban development practice. Simultaneously, financialization threatens to make green urbanism increasingly risky and exclusionary. I argue that these exclusions threaten national governments' visions of a green manufacturing renaissance and their hopes for market-based climate change regulation. To illustrate this critique, I consider US federal plans to harness new environmental value as an engine for generating “green collar” construction employment after the 2008 collapse, and examine how these hopes have run up against today's financialized economy. Finally, I analyze how cities are harnessing green real estate development and retrofitting in urban economic growth strategies, and particularly how they are pioneering new fiscal schemes in a time of urban austerity. On the other side of these markets, I investigate emerging trends in how financial institutions are seeing these new green property-tied financial instruments and forms of urban debt.

Throughout the study, I use contemporary developments in US cities and the national urban context as a set of windows into temporally and geographically farther-reaching processes and pathways of change. I employ different scalar lenses to examine diverse processes and players shaping contemporary urban greening, and to map the geographies that they are creating. I often focus on San Francisco Bay Area and its California context, a metropolitan region and state that have long pushed the environmental-economic margin, and places that now are acting as generative sites for ideas and instruments traveling nationally and globally. Within the Bay Area, sometimes the key place is San Francisco, or Silicon Valley, or the San Francisco-Silicon Valley link; sometimes it is specifically San Francisco's downtown Financial District. Cities like New York and Chicago show up as contending generative sites for green visions and financial instruments. In understanding how green ideas and schemes are traveling and why, other major North American cities like Seattle, Boston, and Vancouver become important. So do cities like Houston and Pittsburgh, and their vastly different regional economic context: today's boom in unconventional fossil fuel extraction and refining. The US federal system and its scalar distribution of authority shape the national urban context for these developments, as does the country's embeddedness in a global system

organized by the OECD, the United Nations, the World Trade Organization, the World Bank and other regional and global institutions.

In Chapter 1, “San Francisco Sees Green: Cities and/as Resource Geography,” I open with a story from San Francisco at the beginning of the twenty-first century. In the late 2000s and early 2010s, the city experienced a major boom of green building. In 2006, the city already boasted a reputation as a globally important center for environmentally sustainable design and energy efficient construction, and it claimed over seventy-nine thousand square feet of building space that was certified green.¹⁰ However, by the spring of 2014, that square footage had rocketed to a total of seventy-one *million*. This massive increase in a few short years demands explanation. It appears particularly paradoxical in light of the economic turmoil that rocked the US economy, and US real estate markets, in the wake of the 2008 economic collapse. One likely driver for this boom is progressive energy and climate policy in California. Building on a thirty-year history of energy conservation programs, green building and retrofitting policies have become an important part of the state’s pioneering effort to lower its greenhouse gas emissions. However, I argue that this policy explanation alone is insufficient.

One clue to what else is behind today’s green wave lies in the fact that remodelings of downtown skyscrapers accounted for the bulk of new certification. Moreover, San Francisco’s property market bucked national trends: the city’s green boom was accompanied by a climbing downtown property values. Its office towers saw a wave of investor buy-ups post-crisis. Through complex financial vehicles including real estate investment trusts (REITs), investors assumed a new role as dominant owners of downtown property. I argue that the greening and financialization of real estate form part of a common trend: that global investors are treating property in world cities like San Francisco as an object of financial speculation in increasingly “pure” ways, and that green certification increasingly defines what financial institutions see as an investable asset. I further argue that these strategies are establishing buildings, and building “greenness,” as new kinds of resources. I illustrate this changing economic role of downtown property in San Francisco through a story of the changing ownership and economic role of the Crown Zellerbach Building, or One Bush Plaza, one of the city’s new LEED Platinum skyscrapers.

Chapter 2, “Resource Geographies in a Green Economy,” digs deeper into the question of how ideas of a green economy are motivating the creation of new resources, things imagined as sources of economic value that, when extracted or more durably cultivated, can fuel novel kinds of accumulation. In this chapter, I introduce theoretically questions that the following three chapters will take up in more empirical detail. I review neoliberalism’s record of market environmentalism, and the new resource geographies that it has created in the name of ecosystem preservation and climate change mitigation – carbon offsets, payments for ecosystem services, tradable wetlands, and the like. I also survey existing critical scholarship on resources. I track pioneering work by geographers and political ecologists on questions of the economic role of resources, the environmental injustices perpetrated in their extraction, and possibilities for sustaining traditional commons and other forms of long-term resource management. And I summarize these scholars’ more recent critiques of market environmentalism. The literature identifies fallacies in market-based schemes’ claims to preserve ecosystem functioning; it also tracks dispossessions of land and livelihood perpetrated in the name of new markets.

I attempt to expand political ecology's (and even the new urban political ecology's) theoretical territory by considering forms of market environmentalism now pushing beyond these rural frontiers in the Global South and North. Previewing discussions in following chapters, I use the example of McKinsey and Company's early twenty-first century work to establish energy efficiency as a resource to illustrate how boosters of a green economy are moving beyond traditional resource peripheries to consider broader geographies, including urban geographies. Global management consultants like McKinsey and major financial institutions like Deutsche Bank have emerged as critical players in opening these unconventional resource frontiers. Simultaneously, as these institutions rose to unprecedented global influence in the neoliberal era, their operations have helped drive contemporary *financialization*, a critical term for the financial industry's growing global economic share and worldwide power. As the opening story indicated and I will argue throughout this account, schemes to develop new resources and a green economy cannot be understood without looking to the way that financial imperatives shape contemporary economic imperatives and possibilities. I thus conclude this introductory chapter by outlining some of the important political economic transformations that have characterized the rise of finance. These pressures shape the stories I tell in the next three chapters.

Chapter 3, "Making Energy Efficiency a Resource," takes up an influential proposal introduced in the previous chapter, the idea that energy efficiency can be a resource, and commodified energy conservation the basis for an economic sector. I discuss how these visions evolved to their current prominence. In the neoliberal era, places like California approved regulatory changes aimed at making energy provision more profitable. With other states in the US federal system, California passed legislation deregulating its energy utilities. It rolled back "natural" monopolistic structures for electricity and gas delivery, ones that had served investor-owned utilities in the United States for almost a hundred years. Deregulation opened up spaces for novel kinds of competitors in energy and power provision, and in a broader emerging field of energy services. For energy efficiency, these transformations meant an era of resource discovery, a major move to value energy saved via building retrofits and behavioral changes, to frame those streams of value saved over time as a market product, and to generate private sector businesses that could produce and capture this value. In the United States, these initiatives more fully commodified a field that had seen innovative public attempts to monetize energy conservation since the 1970s. These interventions ranged from federal energy codes, labels, and weatherization programs to decoupling and demand side management programs run through progressive state public utility commissions; most recently, they have included stimulus efforts undertaken after the 2008 financial collapse.

Despite the turmoil generated by the California electricity crisis, the Enron scandal, and other checkered experiences of the 1990s deregulatory push, the business of making energy efficiency a resource experienced a major renaissance in the late 2000s. A new wave of energy efficiency ventures sprang up, from retrofit companies to advanced materials production to "smart" information technology startups. In this chapter, I focus particularly on building retrofits, as their market expanded from government- and utility-funded weatherization and the institutional and large corporate sector to more mass-market schemes. Notably, this expansion also included a raft of new financing ventures, experiments in making energy efficiency a resource capable of driving financial markets.

Finally, I survey important contradictions emerging in this sector. I note the problem of measuring and verifying energy savings. I also examine the quandary of accounting for the full energy costs of building, retrofitting, or abandoning built environments – in other words, for the basic dynamics of restless urbanization and urban disinvestment in contemporary capitalism.

In Chapter 4, “Green IT and the Problem of ‘Post-Material’ Resources,” I consider another kind of business venture that the concept of energy efficiency as a resource is animating, green information technology. In the late 2000s, a wave of high-tech startups took up the intersection of energy conservation and “smart” technologies; they have been one of the biggest success stories of clean technology development. As I discuss, green IT companies now seek to develop devices that can monitor and report energy use in real time, and to harness the “big data” collected by these devices and utility records to transform energy consumption behavior. These schemes adopt an opposite approach to efforts to develop advanced building controls for energy efficiency. Automation aims to remove active choice from the equation of everyday energy use – or, rather, to maintain and deepen the often habitual, unexamined nature of this consumption in places like the United States. Instead, green IT start-ups seek to motivate consumers to consciously change their energy consumption. They aim to develop mass-market tools that work for homes and other small users, and that can transform practices relatively independently of the buildings that people inhabit. I argue that in attempts to create popular demand for their novel product or to fulfill promises of demand side energy savings made to utility clients, they are mobilizing quite different theories of behavior and behavioral modification.

I also explore problems emerging in this nascent economic sector. I argue that green IT’s visions of behavioral change insufficiently account for the structuring influence of existing built environments. In the United States, these urban landscapes were increasingly built for high levels of fossil energy consumption; air-conditioned, automobile-dependent spaces require ongoing energy consumption to function. Although these material geographies also challenge programs to retrofit buildings and infrastructure for energy efficiency, green IT threatens to ignore the issue entirely. At their most problematic, these high tech enterprises extend a vision of post-industrial and post-material economic development developed in the New Economy. These ideas have helped enable theories of ecological modernization and a green economy. However, they have also influenced US “industrial” policies that facilitated the offshoring of manufacturing and the financialization of the economy. Within the broader field of clean technology development, green IT’s post-material imaginary, and its relative economic success, threaten more of the same. Its success, amid a more broadly disappointing US experience with cleantech since the crisis, speaks to a more general problem. Venture capitalists have preferentially financed green IT start-ups as light footprint ventures, proving reluctant to take chances on investing in more capital-intensive and longer-in-development cleantech manufacturing. Therefore, although manufacturing of technology like solar panels did boom in the late 2000s, it largely boomed in places like China. Meanwhile, solar energy service companies such as SolarCity have cast themselves as other success stories of US cleantech, even as critics argue that their primary “product” is dubious financial engineering rather than technological innovation.

Chapter 5, “Making Green Real Estate Markets,” takes up the question of how green real estate itself is being created as a resource. It digs deeper into the market creation dynamics at work in places like downtown San Francisco today. More specifically, contemporary green economic efforts focus on buildings *certified* as green, whether according to the broad environmental criteria encompassed in green standards like LEED¹¹ or the more focused energy efficiency requirements of the US government’s Energy Star label. I argue that unlike energy saved via efficiency retrofits, which can be priced like energy generated from any other source if achieved (assuming market participants agree on counterfactuals like a building’s baseline energy consumption without conservation measures, never a given), the “green-ness” of buildings had no market before the late 2000s. Commercial real estate owners in cities like San Francisco are banking on more than the value that savings on utility bills might directly add to their retrofitted properties: they are speculating that green certification will make their properties intrinsically more valuable. This green premium might be less than some estimated value of energy savings – or it might be much, much more. Indeed, if definitions of Class A commercial property are recalibrated to require green certification, as real estate industry literature indicates is now happening, then non-green property will increasingly risk major *devaluation* and economic obsolescence.

Understanding these processes of resource discovery, obsolescence, and speculation requires further unpacking the nature of real estate markets, appraisal, and financing. I examine how real estate practitioners have worked to make green buildings valuable. These efforts include the work of certification, establishing commonly recognized standards and labels to make green buildings visible to markets. Scholars have examined similar practices in sectors such as organic agriculture. However, I argue that a critical move of the last five years, and one distinct to the operation of real estate markets, has been work to establish large databases of green commercial properties across US real estate markets, and to track their rental prices relative to non-green properties. Although fraught with potential problems, these statistical efforts have done real work in establishing a green premium. Authors present their findings as indications that tenants are willing to pay more for green, for whatever reason – following conventional practice in neoclassical economics, these demand-establishing exercises do not inquire too closely into underlying value. Even more significantly, they signal to financial institutions that green properties are a distinct, valuable object for investment, and for the construction of financial instruments including specialized property indexes and real estate investment trusts (REITs).

Finally, I consider how valuation practices in real estate markets make new green value uniquely fragile. Because real estate appraisal is so dependent on property comparisons and observed willingness to pay, property value is easily disconnected from underlying “fundamentals”: a ready target for both speculative build-ups and rapid devaluation. Green property is vulnerable to these dynamics, in its own valuation and in broader real estate boom and bust cycles. In particular, US real estate markets are increasingly plagued by an underlying deficit in effective demand. This fundamental weakness reflects growing national economic inequality and insecurity, and how this increasing economic polarization plays out in national and urban geographies. Falling effective demand ultimately collapsed the property bubble of the late 2000s. As the crisis has rippled outward in ongoing foreclosures and investor buy-ups, compromised personal

and geographic “creditworthiness,” and capital flight to cities like San Francisco, effective demand troubles are also shaping and delimiting actually existing geographies of green property.

Chapter 6, “New Resources, The State, and Finance,” provides a theoretical introduction to the second half of this research. This chapter, and the two that follow, more directly consider the different players now taking an interest in unconventional resources and green economic development. I particularly focus on governmental entities, at different scales in the US federal system, and financial institutions. Many resource geographers have discussed the role of the state in opening up resource frontiers, particularly obvious in colonial projects but now manifesting in new forms of imperialism. In this chapter, I explore how new kinds of resources demand new kinds of government intervention. I use David Harvey’s concept of a spatio-temporal fix to draw parallels to past state-structured economic development programs. I argue that despite ongoing neoliberal assaults on the power of national governments, they retain a monopoly on powers necessary to discover and protect new, often-fragile kinds of green value and resources. Today’s novel frontiers in value, and value tied to real property, recall capitalist states’ ongoing role in protecting private property in land – a fundamental relation between the state and nature in the modern era. For public and private actors to realize investment in a “green” spatio-temporal fix today, government entities will likely be vital in other ways: in setting and enforcing new standards and, critically, in unifying economic and environmental policy across large market spaces. In other words, policies like greenhouse gas emissions limits and pricing aim to restructure value throughout major economies – an invaluable subsidy to mass-market green economic development.

Financial institutions join national governments as some of the few entities with resources and power enough to open up radically new frontiers of accumulation. Regrouping after the 2008 financial collapse, financial players like Deutsche Bank took major interest in the green economy, and in other ideas for making environmental change drive profits. I briefly consider how finance capital’s distinct mode of accumulation and geography of operations shape its interest in climate change as an investment frontier. Critically, financial institutions in this way became a potential ally for governments in green economic development programs. However, I argue that finance and financialization simultaneously throw up obstacles to green economic development programs. Notably, finance’s rise has compromised the autonomy of governments including the United States. Financialization has threatened the country’s ability to undertake ambitious industrial development and jobs creation programs on the scale of earlier spatio-temporal fixes. More broadly, it has worked against long-term, “patient,” capital investment – a critical element in proposed fixes of the scale of a proposed green economy. In climate change policy discussions, these delimitations show up in many ways; for example, the naturalization of the idea of a geographical “prisoner’s dilemma” in climate change policy.

In Chapter 7, “Financialization and a Green New Deal?” I examine national green economic development programs, and their conflicts with a legacy of neoliberal financialization, in more detail. In the aftermath of the 2008 financial collapse, the newly elected Obama Administration turned to visions of green economic development in its stimulus programs – a strategy simultaneously adopted by other beleaguered industrial powers. In the United States, the crisis provided a political opening for interests that had

been weakened by thirty years of neoliberal rollout. Groups including organized labor, community organizers, and Rust Belt cities articulated a vision of “green collar” manufacturing jobs in the green economy. At their most ambitious, government entities and activists framed their vision as a Green New Deal. These kinds of references help advance an interpretation of the New Deal that encompasses not just its stimulus and unemployment relief programs but also its role in ushering in mid-twentieth century industrial transformations – and transitions in energy use. I survey this earlier transition, then look to some of the national programs implemented in the late 2000s. I particularly analyze programs that have targeted the building sector for green development, notably energy efficiency retrofitting and the manufacturing of advanced materials and building systems. Green collar jobs advocates devoted considerable attention to the construction sector, continuing a long history of US governmental programs to “modernize” buildings, particularly homes, and their construction – efforts most notably advanced in Progressive Era and New Deal programs.

However, I argue that despite rhetorical callbacks to the New Deal, the Obama Administration attempted to roll out green economic development policies in a very different context. Environmentalist critics have rightfully pointed to the administration’s contemporaneous support for a North American fossil fuel boom as a factor undermining its green programs. I argue that its failure to thoroughly reform the financial system in the wake of the 2008 collapse is an equally significant problem, and a key divergence from the political economic conditions that supported the New Deal. In the New Deal-Keynesian financial order, finance was greatly weakened relative to the state – a strong contrast to the situation today. I illustrate how today’s financialized context matters by exploring the experience of green programs in residential construction. Government efforts to promote green collar retrofitting employment have faced obstacles in an industry that was thoroughly reworked by financialization: converted into public companies on stock markets, concentrated nationally, focused increasingly on land speculation at a national scale, and made ever more dependent on non-unionized, insecure, and often undocumented labor. In addition, like other kinds of capital-intensive cleantech, building materials manufacturers have faced notable challenges in the current moment, ones exacerbated by lingering effects of the financial collapse on real estate markets. In summary, in an earlier era, the disciplining of finance helped the federal government foster an industrial and energetic transition in the US economy. Today, persistent financial capture of the US government and economy threatens to twist, delimit, and fatally compromise the real potential of green economic programs.

Finally, Chapter 8, “Urban Greening and Fiscal Financialization,” returns to a question introduced in the first chapter, how urban governments are taking up new resources and the green economy. Cities are emerging as critical players in greening real estate. When considering the potential economic development benefits of climate policy, earlier urban programs pointed to ideas of aesthetic improvement and increased livability, as well as favorable urban (re)branding and the attraction of a “creative class” to a city or neighborhood. They translated these ideas into urban redevelopment strategies, ones that critics have censured as “green gentrification.” I argue that as formal markets for green real estate emerge, cities are intensifying this new form of speculative urbanism. Urban governments like San Francisco’s are now promoting greening as a way of directly increasing property values. In addition, a central part of these urban programs has been a

search for new fiscal tools, ways of financing building retrofits and other major urban transformations. I discuss how in the late 2000s and early 2010s, institutions such as the World Bank, the OECD, and cities like Berkeley and San Francisco in the Bay Area have put forward a raft of new “green” financial instruments. They range from new kinds of municipal bonds to infrastructure trusts and bids to tap into carbon markets. Critically, they also include instruments designed to harness property value increases created by green retrofits.

I argue that new green financing schemes threaten to deepen the financialization of US urban government, while maintaining growth coalitions’ reliance on rising real estate values. The new programs serve developers, continuing a long tradition of public-private boosterism in US cities. They also speak to the needs of cities forced to be even more entrepreneurial in a neoliberal context. As cities intensified their competition for investment in the last thirty years and sought ways to circumvent tax revolts, debt limitations, and other austerity measures, they turned to ever more complex financing schemes and “shadow” debt systems. California has long been a pioneer in these politics of circumvention.¹² Many of these fiscal instruments, such as tax-increment financing (TIF), drew their value from rising real estate values. In the 2008 collapse and its long aftermath of fiscal turmoil for urban and subnational governments, the United States’ once-secure municipal bond market has been severely strained. Crisis-era demands and austerity pressures have further weakened a fiscal system already strained by years of this off the books borrowing, and suffering from particularly damaging experimental deals undertaken in the 2000s. I argue that a key reason that “green” financing is attractive to cities is that it suggests a new way of circumventing debt limitations. In this context, the new green instruments that mayors and other politicians are proposing may complicate existing debt structures still further – or be used as a wedge to effect a more fundamental transformation of US fiscal federalism. Finally, I briefly consider how financial institutions themselves see new green property-tied financial instruments and forms of urban debt. I suggest that institutional investors in a global context of compromised yields and need for new accumulation frontiers are seeking new investment roles for green real estate and sub-national public debt, particularly in cities like San Francisco. Together, urban politicians and financial institutions are shaping a new era in urban development, creating both new possibilities for climate change action in cities and very real dangers of further speculation, collapse, and accumulation by dispossession.

Chapter 1: San Francisco Sees Green: Cities and/as resource geography

In the early twenty-first century, the city of San Francisco saw a major building boom, of an unusual kind. In the late 2000s, much of the metropolitan region still reeled from the effects of the 2008 financial collapse, and from more direct effects of the predatory mortgage lending and exotic financial engineering that had helped cause it. Foreclosures continued around the Bay Area well into the 2010s, and state and local agencies rolled out drastic austerity measures, the latest episode in California's chronic fiscal illness since the tax revolt of the late 1970s. Simultaneously, however, downtown San Francisco saw a new boom in real estate values. Investors following the lure of a new high tech boom to the Bay Area bought up office towers in the financial district in a major wave of property transfers. In the process, they helped open up new frontiers in real estate speculation, advancing the financialization of urban property in world cities like San Francisco. However, this wave of downtown investment also did something else: it sparked a major boom in the city's certified "green" real estate. Investor owners and corporations retrofitted hundreds of commercial buildings, tens of millions of square footage, in San Francisco to meet advanced green and energy efficiency standards. In this chapter, I unpack this green wave. I look to the city's history of leadership in environmental thought, design, and policy – and, critically, to its role in transforming environmentalism in the late twentieth and early twenty-first century. I argue that developers, investors, and policy entrepreneurs in San Francisco are now pioneering new forms of valuing the "green-ness" of property and making it an unconventional resource for investment and speculation, and that this trend represents a major development in world city real estate in the wake of the 2008 collapse. I illustrate the effects of these simultaneous transformations in the environmental and financial role of downtown property through the story of a particular San Francisco building, the Crown Zellerbach Building (One Bush Plaza), a building that has been at the forefront of many types of resource extraction in its fifty-year history.

A City and Economy in Nature: San Francisco and the Crown Zellerbach Building

In the late 1950s, the Crown Zellerbach Corporation stood at the zenith of its power in the North American timber industry, and at the forefront of the Far West's distinctive resource-based rise to global economic might. With rival twentieth century titans like Weyerhaeuser, Crown Zellerbach churned the massive Douglas fir, Sitka spruce, and western hemlock forestlands of the Pacific Slope into pulp, paper, and immense profits.¹ In 1956, it produced over 1.66 million tons of paper and paperboard and recorded sales and net profits of \$462 million and \$50 million. A few years later, it faced antitrust action by the Federal Trade Commission for dominating the production and sale of coarse paper across eleven Western states.² As Crown Zellerbach superintended this extraction of the region's biophysical abundance and its alchemical transformation into capital, it also demonstrated the work needed to deliver these "free gifts of nature": the "discovery" and

valuation of new resources; the formal redefinition of complex ecologies and cultural ecologies around these narrow objects of economic utility; the technologically mediated transformation of vast landscapes to maximize their yield.³ By the late 1950s, the company managed an extractive-industrial geography that spanned hundreds of thousands of acres of timberland, logging operations, and paper mills along the Pacific Coast.

In 1959, Crown Zellerbach built a new central node to manage the flows of resources and capital through this multi-state and multi-national production system, moving out of its old Art Deco headquarters in downtown San Francisco and pouring its accumulated profits into the construction of a landmark headquarters tower a few blocks away.⁴ One Bush Plaza is a twenty-story skyscraper that monopolizes an entire city block in San Francisco's Financial District, the cluster of office towers around Montgomery and Market Streets in the northeastern-most tip of the peninsula that has traditionally served as the central nervous system for the region's ruling class and claimed the highest property values and rents in the city. The Crown Zellerbach building joined other monuments to the transformed natures of the Pacific Coast, the headquarters of fellow corporate giants that rose on resource extraction and processing: the Southern Pacific Railroad, Standard Oil of California (now Chevron), the Bechtel Group, Del Monte Foods, and Pacific Gas and Electric, among others. It also found neighbors in the leading West Coast financial institutions of the day, including Bank of America, Wells Fargo, and Crocker National Bank. San Francisco banks and financial institutions similarly boomed on the city's longstanding role, pioneered in the 1849 Gold Rush, of organizing Western extractive-industrial booms and collecting, pooling, and redeploying the capital accumulated via these socio-environmental transformations and dispossessions.⁵

With the construction of One Bush Plaza and in its wake, J.D. Zellerbach and his contemporaries in San Francisco's business class helped reorganize the city's second nature with the same thoroughness and ruthlessness that they applied to its regional landscape. One Bush Plaza famously helped inaugurate a new epoch in San Francisco's urban design. The first skyscraper built in San Francisco after the Great Depression, it marked a radical break from the stone and masonry skyscrapers constructed in earlier building booms: one sparked after the 1906 earthquake and fire destroyed most of the city's nineteenth century downtown, and another that joined a wave of skyscraper construction nationwide in the 1920s.⁶ The Crown Zellerbach building helped establish new norms in high design for buildings and sites. Built by the globally prominent architectural and engineering firm Skidmore, Owings & Merrill (now SOM) as it rose to pioneer modernist architecture after World War II, the building was the first International Style glass curtain-wall tower constructed in the city. Its revolutionary floor plan consigned building services to a ceramic tile clad side tower and opened up glass-enclosed office spaces uninterrupted by internal columns. Following the architect Le Corbusier's influential vision of a "vertical garden city" of towers set in parkland, and both fitting and ironic given its central business in ecological alteration, One Bush Plaza's designers also made the novel choice to cede a considerable portion of its triangular site to formal garden space.⁷

Infamously, One Bush Plaza's architects also designed the building to turn its back on the established central business district along Market Street. This decision was one of the opening salvos in a campaign that Zellerbach and his growth machine

compatriots would wage for decades: the fight to “modernize” San Francisco’s urban form and its economy, and thereby to boost the city’s power within a globalizing Pacific Rim economy.⁸ Joining downtown growth machines in other United States cities, they identified nineteenth and early twentieth century built environments and infrastructure as a drag on new accumulation and a threat to their investments in downtown real estate. In the process, they notoriously pioneered utilitarian definitions of property “blight” that muddied supposed economic obsolescence with the physical deterioration of time, environmental weathering, and disinvestment and with the mere presence of African-Americans and other discriminated-against groups.⁹ The Blyth-Zellerbach Committee, its vehicle the San Francisco Planning and Urban Renewal Association (SPUR, today changed to stand for the more politically correct San Francisco Planning and Urban Research), and the federal urban renewal dollars-funded San Francisco Redevelopment Agency organized massive downtown demolitions, displacements, and redevelopments from 1960 onward. One Bush Plaza was soon joined by a wave of similar high modernist glass and steel skyscrapers; critics called it “Manhattanization.” In encoding this new design ideal and suite of building materials into the urban fabric, the growth machine advanced a broader vision cherished by generations of governments, real estate developers, and investors, one expressed in an ever-evolving frontier of architectural fashion: the idea that cutting edge urban design and creative destruction can engender economic growth and transformation, bolster existing real estate investments, and spark fresh booms in property value.¹⁰

Standing testament to the success of this class project in San Francisco, One Bush Plaza has remained in-demand property even as the urban and regional economy continued to change around it. In 1986, Crown Zellerbach fell victim to a hostile takeover, one of many in the mid to late-1980s wave in the United States that was an early product of neoliberal deregulation of the financial industry.¹¹ One Bush Plaza was promptly snapped up as the new headquarters office of the San Francisco investment bank Hambrecht and Quist, one of the regional banks heir to the city’s long post-Gold Rush history as a Western financial center. The space was thus reappropriated by an economic sector with a more indirect relationship to material production and socio-natural transformation, a characteristic change in San Francisco and similar US cities as finance, insurance, business services, and other elite “service sector” functions rose in economic size and share, and US manufacturing continued a long trend of globalization and technological transformation. Hambrecht and Quist used it to organize a wave of regional economic growth and transformations itself often envisioned as “post-industrial” and even post-material: with a handful of fellow San Francisco-based investment banks, it was instrumental in financing the rise of Silicon Valley and contemporary information technology in the New Economy. Hambrecht and Quist underwrote the initial public offerings of companies such as Apple, Genentech, and Adobe Systems in the 1980s, and Netscape and Amazon in the 1990s Internet stock boom and bubble. Meanwhile, mounting analyses have debunked many of digital utopian fantasies, mapping the underlying materiality and often-heavy environmental costs ignored in IT’s post-industrial imaginary: the physical infrastructure and massive energy inputs needed to keep the Internet and networked devices operating; the globalized labor of IT manufacturing; the resource extraction and environmental degradation needed to produce devices; the challenge of their disposal.

In the fifty years since its construction, One Bush Plaza has maintained its designation as Class A property, the highest graded and most expensive class of commercial real estate. This so even as the avant-garde became venerable: One Bush Plaza was declared a San Francisco Historical Landmark in 1987.¹² However, even a structure built to last like this one is subject to slow deterioration; from human usage; from mechanical wear and tear on building systems; from the internal breakdown of materials and the forces of sun, wind, water, small organisms, and other weathering processes. These flows do not make a distinction between glass, ceramic, steel, or wood organized for human structures and materials assembled in any other geomorphological form, except in human occupants' ability to counter them with preventative measures and everyday repairs.¹³ It is this socio-natural evolution and disorganization that, unchecked, is so messily invoked in blight designations. Hambrecht and Quist renovated One Bush Plaza in 1990 to address these kinds of issues and to retrofit it for technological changes to come.¹⁴ A wave of buildings throughout downtown and San Francisco's South of Market (SoMa) would soon follow during the New Economy boom, as developers propelled the district's century-old industrial buildings through much more dramatic conversions and retrofits, exploiting the decline of traditional manufacturing in the region to adapt its structures into digitally capable premium commercial and tech space: another kind of material transformation propelled by the "post-material" economy.¹⁵ In the process, these reorganizations of urban socio-nature helped define San Francisco-specific trajectories of gentrification and racialized working and middle class displacement, which would in the subsequent decades become acute: finer-grained environmental change than the multi-block demolitions of urban renewal but ultimately no less sweeping.

One Bush Plaza's most recent incarnation exemplifies the further transformation of San Francisco and San Francisco real estate in the global economy; the ongoing rise and consolidation of the financial industry, and the changing role that urban property has played within this financialized economy. On the US federal level, the gradual erosion of the Depression Era Glass-Steagall Act, the 1994 repeal of the Bank Holding Company Act, and the 1999 passage of the Gramm-Leach-Bliley Act freed banks to consolidate commercial and investment banking functions and centralize across US state lines. San Francisco's regional investment banks did not survive long against Wall Street's subsequent expansionary push. By 2001, Hambrecht and Quist was no more, bought out by the New York commercial bank Chase Manhattan Bank (now part of JP Morgan Chase, the multinational banking and financial services holding company), then on the hunt to acquire an investment bank and to make a – poorly timed, in 2001 – bid to enrich itself on the speculative side of the region's New Economy boom. What happened to One Bush Plaza in this transition is telling. First, it lost its role as a headquarters building. Its buyer retained one suite as a branch office but turned the majority of the building over to a diverse set of financial and business services tenants, offering twenty to twenty-five rentable spaces at a time. In other words, the buyer targeted the building primarily for its rent revenue-generating capacity rather than for its utility as a space for organizing economic control functions. And second, that buyer, The Government of Singapore Investment Corporation (GIC) Real Estate, helped pioneer now-common San Francisco and global real estate speculation strategies. GIC Real Estate is the real estate investment arm of Singapore's groundbreaking sovereign wealth fund.¹⁶ GIC was an early experiment in this state-finance hybrid investment form, increasingly critical in global

investment. The broader rise of this kind of massive institutional investor, which also critically includes pension funds, and this kind of globalized real estate acquisition strategy are transforming the economic role and significance of urban property.¹⁷

Contemporary changes add up to a treatment of urban property long speculated about by urban geographers and political economists: the recession of its significance in organizing production relative to the meteoric rise in its importance as a financial asset.¹⁸ Although these use value-exchange value tensions in land and real estate are as old as capitalism, and older headquarters towers often set aside leasable space to use for extra income, today's investors have dramatically expanded this speculative strategy.¹⁹ Contemporary financialization has produced a proliferation of intangible financial "products" and secondary markets for commercial real estate investment. This financial engineering forms part of a broader neoliberal era drive to wring new kinds of value out of land, real estate, and real property-related debt: a process of speculative resource discovery and extraction now turned inward on cities themselves and dominated by the financial sector. In the US residential sector, this strategy infamously promoted the packaging of claims on highly risky subprime mortgages into complex residential MBSs and their sale as safe products to pension funds and other institutional investors domestically and internationally.²⁰ Even after this wave of exotic residential sector speculation collapsed in the late 2000s and took much of the US economy down with it, investors are harnessing these tools to open up new frontiers of urban-environmental resource extraction. Financiers seeking to develop commercial properties as assets for institutional investment portfolios and funds have advanced the use of complex instruments like real estate investment trusts (REITs) and commercial mortgage-backed securities (CMBSs). For example, office REITs make it possible for investors to own shares in an office tower or its mortgage, collecting a portion of tenants' pooled streams of rents or repayments over time.²¹ Public REITs allow investors to trade these intangible property claims on exchanges like corporate stock, and thus to speculations on movements in these properties' value.

In San Francisco, use of these vehicles has helped propel an intensified commercial property boom. A new crop of office and residential towers is going up south and east of the Financial District in SoMa, in Rincon Hill and the blocks surrounding the Transbay Terminal; major waterfront redevelopment projects like Mission Bay are transforming downtown. Developers initiated this wave during the 2000s national property boom and bubble. Diverging from more typical national experience, it has picked up in the years since the collapse, propelled by a new wave of Silicon Valley and Bay Area tech development around social media and the "Internet of things." Despite the turmoil in property markets after 2008, the overall assessed value of downtown property has grown almost every year since 2006, with rates of growth in SoMa and Mission Bay that have typically ranged from 10 to 12.5 percent or more annually.²² Real estate investors have positioned themselves to cultivate and extract value from the new jumps in land and property rents, further expanding their use of frontier financial vehicles for this purpose. Replacing corporate owners and even private real estate investment companies, REITs are becoming dominant downtown property owners in San Francisco, and more important in general in US cities whose high tech sectors have been strong post-crisis, like Seattle and Boston.²³ Today, San Francisco's four biggest office REITs own 12 million square feet of downtown real estate, 16.5 percent of the market and growing

rapidly: three times what they controlled before the financial crisis. REITs specializing in residential tower investment control still more. Today, three out of San Francisco's top five landlords are REITs. The longstanding local titan Shorenstein Properties is one of the two privately held companies that stand in exception to this trend.²⁴

The other is Tishman Speyer Properties, the New York-based, globally significant real estate development, investment, and operating company, an investor that is pioneering other frontiers in the rush on property in San Francisco, as part of a global urban investment strategy. Tishman Speyer is today the majority owner of One Bush Plaza, after purchasing it and seven other properties in downtown San Francisco in a burst of acquisition in 2004.²⁵ It now controls over 1.99 million square feet of space in six towers in the Financial District and SoMa. This strategic expansion into San Francisco's commercial property market was typical for the company, known for the massive size of its real estate deals and its targeting of similar kinds of premium commercial properties in global cities worldwide. It famously owns properties like Rockefeller Center, the Chrysler Building, and the MetLife Building in Manhattan. In 1988, it expanded into the European market; in 1995, it targeted acquisitions in Brazil; in 2006, it acquired properties in several cities in China and India. The company now operates a portfolio of over 90.9 million square feet of office space worldwide.²⁶ Tishman Speyer's globally speculative real estate investment strategy exemplifies the contemporary geographic scope of leading investors' reach and ambition, and their increasing power to shape a globalized urban environment.

It also exemplifies another face of finance as an extractive industry, finance's power to accumulate by dispossession. Tishman Speyer is infamous for its 2000s bubble practices of highly leveraged "OPM" investment; i.e., "other people's money".²⁷ These uneven social costs of real estate speculation assert themselves even in a commercial sphere that has fought to distance itself from the broader US misery of ongoing residential foreclosures and landscape abandonment. They are demonstrated in the widely criticized crisis-era failure of Tishman Speyer's Stuyvesant Town development. In 2006, it had touted this New York City acquisition as the biggest real estate deal in history. When the development failed, Tishman Speyer itself lost \$56 million. However, it passed the bulk of this loss onto its lenders and other investors, including California's public pension fund (CalPERS): they lost over \$2.4 billion. But these frontiers of financialized accumulation by dispossession are now taking broader geographic form and environmental significance.

This story has followed processes that have long preoccupied urban geographers and political economists. It mapped several waves of transformation in San Francisco's economy, regional changes connected to broader reorganizations in the US and global economy. Particularly, and drawing on Marx, Schumpeter, and other theorists of non-equilibrium economic development, it emphasized how leading economic players have periodically reimagined and revolutionized the leading-edge frontiers of accumulation over the last hundred years and more. Guided by geographical political economy, it took a broad view of these leading edge strategies, considering frontiers that could be geographical, technological, organizational, or all of the above.²⁸ As it tracked the production and creative destruction of One Bush Plaza and downtown San Francisco, it also demonstrated how these economic transformations have played out in reorganizations of urban space. It tracked how corporations could build or appropriate

buildings like One Bush Plaza to be functional spaces for organizing production networks, part of their broader geographical industrialization strategies. It considered how spaces like One Bush Plaza could simultaneously lead a pseudo-independent economic life as sunk capital and an ongoing investment in the value of urban property, a complex role that urban political economists have long tracked. It also connected economic change to evolving ideas of modernity and obsolescence in the built environment, observing how the perpetrators of urban creative destruction have historically invoked both physical deterioration and in-flux notions of what constitutes technologically, aesthetically, and economically “modern” property.²⁹ And it considered the powerful ways in which financialization is transforming these urban economic processes and property relations, a question taken up by many critical commentators in the wake of the subprime mortgage collapse.³⁰

This story so far has also explored many ways in which One Bush Plaza and its surrounding urban fabric work as socio-natural spaces. According to this account, tracking their production and reproduction means mapping flows of material and capital through evolving resource and production hinterlands regionally and globally, surveying major waves of transformation in the urban built environment and in the economic *significance* of the urban built environment, and making visible the slow workings of building weathering and other metabolic processes. As urban political ecologists and environmental historians have chronicled, some of these entanglements of human social and non-human nature are as old as cities. Others are products of an evolving industrial capitalism and its specific ways of using and transforming urban spaces. It is the (often partial and uneven) *perception* of these connections that will be most important in this story, and what that framing is put to work to accomplish. Importantly, these linkages include processes that political movements have taken up as defined problems and as loci for transforming the city. In the US, the City Beautiful and Garden City movements of the early twentieth century marked two such environmentalist problematizations and urban redesigns; San Francisco’s Golden Gate Park and regional park system are part of their legacy.³¹ The environmental movements of the 1960s and 1970s perceived other problems and proposed other interventions, as we will see.

Seeing Green in San Francisco

The current moment marks an important transformation in how the nature of cities is being seen, problematized, and used to generate new political and economic visions. The city’s executive class is using the language of green building, energy efficiency, and urban climate change mitigation to frame buildings like One Bush Plaza and cities like San Francisco as environmentally significant in radically new ways, and they are claiming a new stake in the kind of city being imagined in response. One Bush Plaza and similar pieces of real property are key elements of the public face, and the underlying economic strategy, of this movement.

In 2014, One Bush Plaza stands acknowledged as one of the “greenest” buildings in San Francisco. It is recognized by several of an increasingly large number of schemes that now calculate and certify buildings’ energy and environmental performance. Like the broader urbanization of climate change, these labels and their proponents

imaginatively redefine and rescale the issue. In this framing, climate change becomes a problem of the built environment: a cost of buildings' use, and, depending on who is looking, sometimes also a life cycle cost of their construction and demolition. For example, the San Francisco Department of the Environment frames the problem like this:

*Buildings come at a cost. In the United States, buildings account for 70 percent of the electricity, 40 percent of the raw materials, and 12 percent of the potable water we use. In San Francisco, 56 percent of greenhouse-gas emissions are attributable to buildings.*³²

The argument that buildings and their use are a key driver of climate change does several kinds of work. Notably, it suggests a different set of solutions than greenhouse gas emissions accounting schemes that report only more generalized energy use, as the US national inventory still does.³³ These more abstract ways of seeing emissions have helped focus attention on types of fuel used and their potential substitutes. In contrast, the new framings emphasize finer grained energy consumption, its many determinants, and their potential transformation.³⁴

Making climate change about the built environment has strengthened the green building movement in the United States, as well as more diffuse but growing efforts around buildings and energy. The basic idea behind sustainable building, according to the model of the US Green Building Council (USGBC®) and other green certification schemes, is to connect building production and use to many different kinds of environmental issues: from energy consumption and greenhouse gas emissions to tree-felling for structural lumber to water usage to the use of toxic materials. Proponents suggest that solutions can be found in innovative architectural and landscape architectural design, advances in structural engineering, transformed construction and sourcing processes, and innovative retrofits to existing structures. They also point to a connection between buildings and the behaviors that occur within them, including energy use, a linkage that has become a target for other kinds of creative redesign. Proponents have consistently framed the key site for action as individual buildings. They claim, or claim by implication, that the independent production of many new or improved structures can aggregate into broader landscape transformations and revolutions in practice.

Finally, this moment is about market-based environmentalism: about new perceived economic opportunity and the creation of new kinds of resources. These visions have deeper roots in the development of energy and environmental thought since the 1960s. San Francisco, Silicon Valley, and the Bay Area have been particularly important generative sites in this process, from countercultural green experimentation, through the rise of neoliberal market environmentalism and pushes for energy market deregulation in the 1990s, to the late 2000s boom of interest in cleantech and the green economy.

Green Roots and Branches

Green building has deep roots in the Bay Area. The landscapes of Berkeley and the East Bay were shaped by the influence of the Anglo-American Arts and Crafts movement, a late nineteenth-early twentieth century wave of environmentalist and neo-traditionalist design that reacted against industrial manufacture and industrial cities.³⁵ In its modern form, green building, and its connection to new ideas in energy generation and conservation, has been strongly influenced by the Bay Area's late 1960s and 1970s ferment of high tech futurism and neo-traditionalist environmental localism.³⁶ Critically,

that has meant nurturing market environmentalism. Influential San Francisco countercultural thinkers and institutions like Stewart Brand and the *Whole Earth Catalog* took up sustainable building. Brand enlisted Bay Area builders and industrial designers, notably Lloyd Kahn and James Baldwin, to edit “shelter” and design sections of the catalog. In this publication and the movement it helped spark, these thinkers helped repopularize passive solar design, as well as other traditional construction practices and vernacular building styles.³⁷ At the same time, they took up futurist ideas like R. Buckminster Fuller’s visions of geodesic domes and advanced materials.³⁸ In Bay Area centers of the movement like Bolinas in Marin County, they furthered ideas of “appropriate technology” developed by E.F. Schumacher, claiming to mitigate the pitfalls of technology by keeping it human-centered, energy-efficient, and above all decentralized and local. Critically, this movement advanced a vision of environmental activism that eschewed protest and, often, other action in the public political sphere. Instead, it focused on the creation and voluntary uptake of alternative technologies and lifestyles; typically in households, sometimes in local communities.³⁹ The legacy of this atomistic scale of action and focus on green consumption continues to be felt in today’s green building movement. Notably, the movement also advanced a version of greening that was far more optimistic than traditional environmentalism about the possibilities of technological innovation and the possibilities of reconciling economic growth and environmental protection.⁴⁰

The technological futurism of this version of environmentalism helped make it work within the mainstream political sphere. The state of California under Edmund G. (Jerry) Brown’s first administration from 1975 to 1983 became an early testing ground for this energy and environmental futurism. For example, James Baldwin worked in the new California Office of Appropriate Technology under Brown, the governor appointed Stewart Brand as a special advisor, and Sim van der Ryn, an important pioneer of sustainable design, took up an appointment as California State Architect.⁴¹ In the context of the 1970s energy crises, the administration passed groundbreaking legislation on renewable and distributed energy generation and energy efficiency. These policies reflected the influence of thinkers like Amory Lovins, who went on to found the Rocky Mountain Institute.⁴² They also drew important impetus from work done by Art Rosenfeld, who in 1975 organized what would become the Center for Building Science at Lawrence Berkeley National Lab. The Center has since pioneered research on compact fluorescent light bulbs, more efficient appliances, windows, and other building materials. These new materials fed into the state’s pioneering energy efficiency policies like appliance energy standards and the state’s Energy Code for buildings (Title 24, part 6 of the state code of regulations).⁴³ Worked on by van der Ryn, Rosenfeld, and others and implemented starting in 1978, Title 24 established mandatory energy requirements for new or substantially remodeled construction: the nation’s first energy building code. The California Energy Commission (CEC) has progressively tightened the code over the years; many claim it as a major factor in why the state’s per capita electricity use has remained flat over the last thirty years, as the rest of the nation’s average consumption has climbed.⁴⁴

The 1970s conjuncture left an additional legacy in California policy, and far beyond, in monetizing energy efficiency. It helped making the state a leading player in (in theory) reconciling environmental and economic needs, and mapping new kinds of

resource frontiers. Ideas developed in the 1970s like Amory Lovins' concept of "negawatts" to characterize energy efficiency itself as a resource, one comparable to any of utilities' traditional fuels sources and generation, transmission, and distribution apparatuses. They fed utility programs described as demand-side management (DSM) and other labels like decoupling, with the California Public Utility Commission (CPUC) a leader. The CPUC promoted innovative utility DSM programs aimed at framing energy efficiency, and more efficient buildings and equipment as part of investor-owned gas and electric utilities' resource strategies. They modeled business-as-usual customer consumption baselines, replaced light bulbs and other appliances, organized building weatherization, and measured and verified resulting energy savings; while the CPUC approved spending on these initiatives alongside generation facilities as part of utilities' costs of providing energy services. Other US states also took up DSM and related programs. However, many states' efforts were hindered as urgency around energy conservation receded after the 1970s. California continued as a regional center for innovation, creating a new way of thinking about energy efficiency that is increasingly influential today.⁴⁵ (At precisely the same time, California pioneered US neoliberalism, as 1978 also saw its approval of Proposition 13 by ballot initiative. This radical residential and commercial property tax limitation measure sparked the nationwide Tax Revolt, echoes of which continue to be felt in today's Tea Party politics of libertarian fiscal austerity and which pervade today's visions for urban futures in California and beyond.)⁴⁶

Ultimately, the Bay Area's 1970s energy and environmental counterculture reconciled its futurism with the political mainstream, and with capitalism's growth imperative, in even more thoroughgoing ways. The legacy of this thought has helped move environmental issues to the center of capital accumulation. Fred Turner argues that thinkers like Stewart Brand, the *Whole Earth Catalog*, and the broader countercultural movement influentially shaped Silicon Valley, particularly as it turned with increasing enthusiasm to personal computing and what would become the Internet. Many scholars have persuasively argued that a counterculture-influenced culture of open flows of information, collaboration, and experimentation relative have been instrumental to Silicon Valley's global dominance as a high tech innovation region for the past thirty plus years; particularly when contrasted with more hierarchical, closed corporate cultures in high tech hubs like Boston and Los Angeles.⁴⁷ At the beginning of the twenty-first century, leading figures in global capitalism like Steve Jobs would cite the influence of the *Whole Earth Catalog*.⁴⁸ And as part of Silicon Valley's latest wave of transformation, many of its tech entrepreneurs have rediscovered their interest in futurist green innovation, as can be seen, for example, in publications like the Lovins's *Natural Capitalism* and a wave of enthusiastic rhetoric about the promise of the green economy.⁴⁹ Growing interest in clean technology has prompted a wave of start-ups aimed renewable power, energy efficiency, advanced building materials, green software, and other climate change-relevant innovation. Continuing a long legacy, they are unapologetic about the fact that they aim to get rich en route to changing the world.⁵⁰

New thinking around cleantech has been one driver of a larger transformation in the relationship between mainstream environmentalism and capitalism, a thirty-year political shift that critical scholars have variously analyzed as the neoliberalization of the environmental movement and the greening of neoliberal capitalism.⁵¹ As they have

described it, once-fringe environmental organizations have grown larger and moved center, developing an increasingly collaborative stance towards large corporations. Ideas of ecological modernization and sustainable development provided conceptual justifications for trying to direct rather than fight economic growth. And, in the wave of activity described above, powerful economic players began to take up the idea of environmental markets as an arena for accumulation and speculation.⁵² As today's green building movement took shape during the 1980s and 1990s within institutions like the American Institute of Architects and places like San Francisco, it formed an important development within this broader wave.⁵³ Many pioneers in sustainable design located their firms in San Francisco, from van der Ryn to Peter Calthorpe, the developer of the concept of transit-oriented development and a founding member of the Congress for New Urbanism. The Bay Area has continued to grow as a center for green building, as internationally known firms like William McDonough+Partners opened San Francisco offices in the 2000s and locally based firms like Leddy Maytum Stacy, organicARCHITECT, and Perkins+Will won national and international recognition for sustainable design.⁵⁴

The incorporation of the US Green Building Council (USGBC®) in 1993 helped mainstream green building and deepened its market environmentalist character. A major area of practice became coming up with voluntary building labels and identifying niche green projects for consumers. Characteristic of the USGBC market orientation, its standards were designed to work via voluntary certification rather than government mandate.⁵⁵ Labeling was meant to create a new green market class for buildings over and above any required building standard, a similar idea to contemporaneous efforts at organic food labeling. The non-profit developed a standardized design philosophy and approach in the Leadership in Energy and Environmental Design (LEED™) building certification label, established in 1998. It helped spread the acceptance of this scheme through LEED accreditation courses and increasingly numbered building industry representatives in the council: particularly as the standard has expanded from early dominance by public buildings to the private market.⁵⁶ Although there are other similar schemes in the US and especially internationally, the USGBC and LEED now dominate the US market according to a range of measures including the number of buildings certified, nationwide distribution of these buildings, traction with government agencies, influence within architectural training and practice, and number of accredited professionals. The Bay Area remains a hotspot: In 2009, the San Francisco-Oakland region had the second most LEED accredited professionals (APs) in the United States, topped only by New York City.⁵⁷ In 2014, LEED APs and Green Associates in San Francisco totaled 3,806.⁵⁸

However, this success has also provoked increasing criticism and spurred division over the nature of sustainability in the built environment, and the costs of market environmentalism. As LEED has risen in influence within the field of sustainable design and in mainstream real estate development, critics have argued that the label is too easily manipulated by real estate developers and is, indeed, increasingly synonymous with these big construction and development industry interests. They allege greenwashing: that developers can claim green bona fides with only cosmetic design elements. And they demonstrate skepticism about the USGBC's efforts to grow its "brand." LEED certification is not free or a public service, it is a private enterprise for which building

owners must pay. The USGBC is itself a non-profit, but channels fees into growth of the organization and the proliferation of new LEED labels, from LEED for interiors to LEED for homes to LEED for neighborhood design. This process has spawned a cottage industry of dedicated consultants and accredited certifiers, with expertise specific to the USGBC's complicated checklist-based certification processes. Conflicts have often centered around how to define a green building: the subtext is who is empowered to make that determination, who is also empowered to make money out of that process, and how.

Some of the most important critiques of LEED and the USGBC have come from energy and climate change policy communities, broadly defined.⁵⁹ Transportation and regional planning-minded commentators like New Urbanists have blasted the USGBC for certifying buildings located in far exurbs and other "greenfield" sites: ones often inaccessible to public transit, bicycle, or pedestrians and at the leading edge of direct landscape change.⁶⁰ Blindness about automobile-dependent sites and the broader urban landscapes around each building become especially problematic when oil use and resulting emissions can no longer be swept under the rug. In addition, energy efficiency and conservation advocates have criticized LEED for not giving more priority to buildings' operational energy use. They argue that LEED™'s certification procedure allows energy, and therefore climate, considerations to be eclipsed by sustainability criteria that they argue to be less significant, and that the standard contains insufficient protocols to track and certify ongoing energy performance. Many have argued that achieving significant operating efficiencies, and particularly more ambitious visions of net zero energy and carbon neutral buildings, requires more whole-building redesign than LEED promotes. Finally, critics point out that given precedents for large gaps between design intentions and actual energy use, and the fact that even effectively designed buildings require ongoing systems maintenance and commissioning, LEED™'s lack of protocols for decertification is a major problem. These disputes heated up in the late 2000s, as prominent lawsuits alleged that the USGBC had actionably overstated LEED™'s performance as an energy standard, a conflict increasingly important as the field saw a rush of new entrants and money.⁶¹

From its common roots in late 1960s and 1970s environmentalism and energy crisis, a more energy-focused community of practice branched off from green building over the next few decades. This divergent evolution has helped generate today's conflicts. In the US, much activity in energy and buildings has occurred under the aegis of the Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE), national labs, and research non-profits like the Washington, DC-based American Council for an Energy Efficient Economy (ACEEE). In addition to establishing appliance codes, national model energy building codes, and operating home weatherization programs with the US Department of Health and Human Services, the DOE's Building Technologies Program works with the US Environmental Protection Agency to operate Energy Star[®], an energy-specific building label.⁶² The EPA initiated this voluntary certification scheme in 1992 under the Clinton Administration. It aims at creating a premium market for products that significantly exceeded the DOE's energy efficiency requirements, and to incentivize innovation by equipment producers. The DOE became involved in 1996, when the program was expanded from appliances to score whole buildings and label them for exceptional energy performance.

In the 1990s, and partly inspired by the proliferation of new energy technologies developed by national labs and Energy Star producers and the pricing of energy efficiency in DSM and related programs, California led a new trend in energy provision: it proposed to transform electricity and gas provision from a mature capitalist backwater into an epicenter of new market creation, technological and economic innovation, super-profits, and leading-edge accumulation overall.⁶³ Part of the way it aimed to do so was by the full commodification of energy efficiency as a resource: setting it loose from the highly regulated context of CPUC regulated and government-calculated and granted value to a resource meant to work in private markets, ones nominally increasingly free of state interference. The state pioneered energy utility deregulation and became a leading site for the rise of Energy Services Companies (ESCOs). Prominent in a wave of new energy businesses envisioned for a transformed market, ESCOs proposed to join or fully replace utilities as providers of a broad range of energy services, including efficiency retrofits. Dramatically expanding a model originally developed in the 1970s energy crisis, ESCOs conducted energy audits of large institutional and commercial buildings and campuses, commissioned building energy systems, replaced equipment, automated building energy management, and designed other tailored interventions into particular buildings' and enterprises' energy use.⁶⁴

These businesses specifically targeted the ways that buildings break down over time, both shells and particularly large building systems: the kinds of things bound up in notions of the physical dimensions of blight and obsolescence, expressed here in the ways that these deteriorations create inefficiencies and waste in the use of energy to operate the space. These enterprises proposed to fill a gap and create a market: from government-funded weatherization, which focused on homes and basic energy needs, to the kind of business needed to make energy efficiency in existing buildings something visible, valued, and a source of profit for both building owners and those producing these retrofitted buildings.⁶⁵ In this view, existing buildings represented a major incipient market. For example, in California the CEC estimates that almost half of the state's existing commercial buildings were constructed before Title 24's energy code came into effect; almost three quarters before 1990, as standards tightened.⁶⁶ ESCOs took their fees out of energy and energy costs saved, and often included in-house or third-party financing packages to cover the upfront costs of these retrofits. Enron's Energy Services was one high profile ESCO of the period.⁶⁷

These trends would cause major turmoil within energy efficiency initiatives in California and nationwide, as investor-owned utilities shrunk DSM activity in anticipation of a nationwide wave of deregulation and the opening up of energy markets to many new kinds of competitors.⁶⁸ Most dramatically, California's deregulation push infamously enabled speculative gaming of these new markets, culminating in the state's electricity crisis in 2001. The crisis included rolling blackouts and the bankruptcy or near-bankruptcy of the state's largest investor-owned utilities including Pacific Gas & Electric (PG&E) in the Bay Area and Southern California Edison. Ultimate casualties included Governor Gray Davis's administration, other planned utility deregulation efforts nationwide, and many ESCOs. Revelations of Enron's market manipulations and fraudulent accounting soured the ESCO market for years, as utilities running ESCOs refocused on their core businesses and independent ESCOs failed or consolidated.⁶⁹ Ongoing destabilizations from California's deregulation continue to make energy

provision turbulent in the state. Conflicts include bitter fights between PG&E and proposed competitors, particularly green-oriented community choice aggregation schemes in the Bay Area.⁷⁰

Despite this turbulence, the crisis indirectly stimulated for deepening market environmentalist pushes as well. In the reform-minded aftermath of the crisis, organizing around greenhouse gas emissions in California gained new force. In 2006, the legislature successfully passed and Governor Schwarzenegger signed Assembly Bill (AB) 32, the Global Warming Solutions Act. AB 32 represents internationally significant climate law, both as a precedent for legally binding sub-national climate policy and because California's emissions dwarf those of most countries. California's climate policies have helped propel a fresh wave of experimentation in energy and environmental markets. It is critically important in today's market environmentalist climate framing. AB 32's policy mechanisms include a statewide greenhouse gas emissions market, the world's second largest in emissions covered after the European Union's Emissions Trading System (ETS).⁷¹ As critical analyses of the EU ETS and voluntary carbon markets have chronicled, "carbon" markets push the frontiers of market environmentalist experimentation; they have exemplified its tendencies toward speculation and manipulation as much as its enthusiasm for the economic potential of new environmental value and resources.⁷²

Over and above emissions markets themselves, California's market environmentalist experiments in the late 2000s have included a revival of ESCOs, including ESCOs operated by major equipment manufacturers like Honeywell and Johnson Controls. It also saw ESCOs expand, like LEED, from predominance in the public and large institutional sector to more commercial real estate and the private market in general. And in the Bay Area, it helped catalyze Silicon Valley's wave of interest in cleantech in an even broader way. New start-ups targeting energy in buildings included a proliferation of energy retrofit companies that extended beyond ESCOs' traditional focus on large buildings and specialized interventions: the new businesses sought new solutions for smaller buildings including homes, and more standardized retrofits. By 2013, some of the most prominent cleantech ventures in this sector sought to apply to the task of energy conservation approaches being developed around social media and devices, in partnership with a new generation of utility DSM programs in California and nationwide or as independent ventures. For example, business models include the use of big data; automation, and a raft of "smart" meters and control technologies; gamification; and other behavioral manipulation schemes to analyze and transform energy use patterns. In the turmoil of the late 2000s, the federal government also used to economic stimulus money to fund frontier building energy efficiency technologies via its Advanced Research Projects Agency-Energy (ARPA-E), as well as a raft of other measures to promote energy efficiency and clean energy. For example, Stanford University's funding under ARPA-E includes an \$8 million grant dedicated to energy efficiency and behavior, entitled "Large-Scale Energy Reductions through Sensors, Feedback, and Information Technology." The program aims to pioneer ways of harnessing building smart meters and other real-time energy-sensing devices and big data collection efforts for behavioral change. Jerry Brown is back in office, and the appearance on the scene of figures like Tom Steyer demonstrates how the US's economic elite is dividing over climate change and cleantech, ideologically and geographically. Steyer, the San Francisco hedge fund

billionaire personally bankrolled a major fight against a 2010 attempt to repeal AB 32 via ballot initiative, a process itself back by the Koch Brothers and their oil and gas money.⁷³

Greening One Bush Plaza

One Bush Plaza's experience with energy efficiency retrofits and broader greening exemplifies how these Bay Area, California, and national trends are reshaping particular buildings and urban landscapes. These trends are simultaneously environmentally significant and a source of new kinds of resources, business, and economic growth. The processes by which One Bush Plaza's owners and certifiers have made it visible as environmentally significant, green, innovative, and valuable are themselves important, as are the forums in which this information is displayed. All have been revolutionized in the last few years. For example, I first identified One Bush Plaza as a green building of interest by searching Bay Area buildings registered in the USGBC's Green Building Information Gateway (GBIG); I could have selected many others to tell variants on this illustrating story. The USGBC created this publicly accessible web-based search engine and data platform in 2012 for web users to find and compare buildings, according to different definitions of greenness and various other factors.⁷⁴ Using that site in 2014, I could see that One Bush Plaza had earned the distinction of being one of San Francisco's most highly certified buildings according to LEED, Energy Star, and various other green certifications. I could see the recent history of its certifications, and its tenants' certifications. I could see it on a map of other certified-green buildings in San Francisco. I could view the specific strategies by which it had attained the USGBC's LEED certification. I could even group it with other kinds of green buildings based on location, attribution, or greening strategies employed.⁷⁵ Cross-referencing One Bush Plaza via the directory of projects on the USGBC's official site, I could find a more detailed breakdown of the building's LEED certification checklist and points, along with a peer-reviewed narrative statement summarizing the building's greening and certification process, and lessons learned.⁷⁶

This display of information provides a window into some of the strategies by which the USGBC is currently promoting green building, and simultaneously advancing its own expert position and brand. The information itself demonstrates what contemporary greening can look like. Tishman Speyer first launched efforts to register One Bush Plaza with the USGBC in 2010, although one of the building's tenants, the San Francisco office of the international design, architecture, and engineering firm HOK, had earned LEED certification for its suite by 2004, appropriately for a firm recognized as a leader in green design.⁷⁷ LEED's approach uses a detailed checklist to assign points for different kinds of sustainable performance, which certifiers assess separately and aggregate to assign a total score. Broad categories range from energy and water use efficiency to sustainable site design and location, green materials and waste management, and indoor air quality. In 2011, the USGBC recognized One Bush Plaza with a Platinum level certification, its highest building rating. Using the 2009 version of the LEED certification metric, the building scored eighty-three out of a possible 110 (100 points plus ten bonus points for things like promoting innovation and addressing environmental issues designated to be of particular regional priority). A rank of forty points is sufficient to get a building LEED certified; those buildings are supposed to represent the top twenty

five percent of existing buildings in the US. Classifications above that include Silver and Gold, with scores eighty and above necessary for a Platinum rating.⁷⁸

The specific LEED classification and checklist that the USGBC applied to One Bush Plaza was its LEED for Existing Buildings: Operations & Management (EBOM) standard. In other words, it certified One Bush Plaza's retrofit rather than its original construction or major remodeling. The creation of this label was an important step for an organization and label long associated with high-design new buildings. The more established LEED certification considers the costs in materials, energy, and environmental disruption needed to construct new buildings. It does not address the fact that most of the built environment in the US is already set down, and that simply demolishing and rebuilding these landscapes for green performance has major energy and environmental – as well as social – costs. Tishman Speyer advertises that, when labeled, One Bush Plaza was one of only six buildings in San Francisco to obtain the EBOM certification, out of forty-six buildings nationally. Demonstrating the degree of qualification building owners can muster in order to claim “first,” it also argues: “One Bush is the first multi-tenant building older than 50 years with no major renovations in the Bay Area to obtain the prestigious LEED Platinum certification.”⁷⁹

EBOM adopts a foreshortened view of environmental impact, mostly ignoring the kinds of original construction costs that LEED typically addresses and focusing instead on how to improve buildings as they exist today. For example, One Bush Plaza's original construction in the late 1950s would have meant a spike of energy use and resource consumption. If it had existed at the time, LEED might have changed some decisions: for example, the choice to plant a large site with non-native, water-hungry plants and landscape design features in a water-constrained environment like the Bay Area. LEED EBOM largely does not make the building's current owners responsible for these past impacts, beyond awarding no points for LEED certified design and construction. The building's current owners and tenants are fortunate that Crown Zellerbach and SOM utilized design features like daylighting: mid to late-twentieth century windowless, fluorescent-lit commercial boxes can be heavy energy users for lighting.⁸⁰ These kinds of features and the ongoing practices that they impose are more or less easy to change in an existing building. They represent a huge challenge for targeting the built environment as a site for reducing water usage, energy consumption, or greenhouse gas emissions.

The kinds of things that Tishman Speyer initiated to get an EBOM Platinum score are telling. For example, Tishman Speyer achieved a lot of points by the simple expedient of converting its plantings to native species, shifting from automated sprinklers to hand-watering, retaining its site as greenspace rather than hardscaping, and promoting other green site management practices. Using One Bush Plaza as a featured example in its corporate sustainability report, Tishman Speyer claims:

*At One Bush Street, we leveraged our local knowledge of landscaping practices in San Francisco's unique climate to conserve resources. By using native and adaptive plants that require less water, and sandy soil and grading that permitted greater water retention and less runoff, our new landscape design for One Bush Street achieved an extraordinary reduction in water use.*⁸¹

The EBOM standard that it employed does not question the high modernist 1950s-era design decision to leave so much open space on an urban site. Instead, EBOM values changes made to this existing site: mitigating its current environmental impacts, and even

turning the site into an opportunity for new points. For example, these new points include mitigating the urban heat island effect (one point), protecting or restoring open habitat (one point), controlling stormwater (one point), planning to manage the building exterior and hardscape management (one point), and practicing integrated pest management, erosion control, and landscape management (one point). Certifiers decided that One Bush Plaza merited three points for water efficient landscaping, although it could have earned up to five; it did get an extra bonus point for water efficient landscaping because that was a “regional priority credit.” Its narrative claims the site as “protected/restored habitat” and “open space for public use,” although the meaning of both become questionable here: it was built on land that had been urbanized for a century and razed to the ground multiple times by human and natural forces. Its high modernist park site has drawn criticism in a post-Jane Jacobs era, in which New Urbanist design ideals of mixed-use site design have become a preferred way for opening private sites to public use to One Bush Plaza’s aesthetically pleasing but not particularly welcoming or multi-use plantings and public art.

Another important element on One Bush Plaza’s high LEED score was its proximity to mass transit and central location. The EBOM checklist reserves a relatively massive fifteen potential points for this locational assessment, part of the USGBC®’s response to criticisms about its neglect of these urban landscape considerations. One Bush Plaza earned all fifteen of these points, plus a regional priority bonus point for access to alternate commuting transportation. Partially in response to critiques of LEED™, other entities have developed more specific transformation and location metrics. In addition to tracking LEED certifications for buildings like One Bush Plaza, GBIG reports green location ratings for One Bush Plaza in terms of walkability and transit access using numbers from Walk Score®. Walk Score is a private company that publishes assessments of the walkability, transit access, and bikeability of properties and attaches its ratings to real estate transaction-related documents. Development of its public transit assessment tool was partially funded by the Rockefeller Foundation. The company ranked One Bush Plaza’s walkability as ninety-eight out of a possible hundred and its transit access as a perfect 100 out of 100, attaching qualitative tags of a “Walker’s Paradise” and “Rider’s Paradise.” This green performance reflects the building’s downtown location, particularly its close proximity to regional rail via one of the downtown Bay Area Rapid Transit (BART) stations and many bus and streetcar stations of San Francisco’s Municipal Railway (MUNI) system.⁸² Like One Bush Plaza’s site design, this is an attribute that Tishman Speyer inherited when it bought the building rather than creating. It could, however, be interpreted as the outcome of past action associated with One Bush Plaza, the 1960s and 1970s work of J.D. Zellerbach and the Blyth-Zellerbach Committee to make sure BART and other Bay Area transit systems prioritized regional access to San Francisco’s Central Business District – a process which simultaneously caused massive racialized demolitions and displacements in places like West Oakland and starved older transit networks of funds.⁸³

Despite ongoing tensions around LEED as an energy label, One Bush Plaza’s energy performance and activities were also a major part of its Platinum EBOM rating. Energy efficiency in operations was the largest single source of points awarded, with sustainable sites second.⁸⁴ The building separately earned points for investigating ESCO-style building commissioning and implementing it (two points each). Although it did not

earn points for performing this commissioning on an ongoing basis, its narrative claims that it will undertake this practice in the future. An anecdote from a consultant that Tishman Speyer employed to facilitate its LEED certification process better demonstrates what that process can look like: “the value of commissioning was that it helped us find low-hanging fruit - five or six low/no-cost items - all done during the performance period. One Bush performed a thorough testing of its systems (including HVAC, lighting, electricity) to make sure they work and interact as designed. This comprehensive testing identified 11 different savings opportunities.”⁸⁵ Specific system upgrades included changes to air damper settings, condensers, and chillers in the HVAC system. The company also retrofitted lighting in the building lobby and budgeted for planned future retrofits in stairwells and offices, dealing with a common problem of retrofitting occupied, multi-tenant commercial buildings by planning to make these changes gradually as tenant leases turn over. It did not implement any on-site renewable energy strategies (six potential points), but it did earn a point for tracking and reporting its greenhouse gas emissions and projected reductions. Along this line of automating and collecting data on building energy performance, the company plans to install lighting occupancy sensors and other automatic building controls. It earned one point for its moves in this direction, for its existing automation system and its installation of system-level metering and sub-metering: the infrastructure of ongoing real-time energy monitoring and “big data”-based initiatives to alter it.

Finally, the building’s most important points for energy performance, seventeen out of a possible eighteen, plus an extra regional priority bonus point, came from the more generic category of “optimizing energy performance.” One Bush Plaza had already used energy modeling for years before the LEED certification process. Tishman Speyer had applied for an Energy Star certification in 2008; it had the building re-certified in 2010 and again in 2012. The building’s operational energy performance relative to comparable buildings improved with each certification. In 2012, it earned a high score of ninety-five out of a possible 100; in other words, better than ninety-five percent of its peer group in 2012, as calculated by the EPA’s Energy Star Portfolio Manager benchmark based on reported building characteristics and utility bills.⁸⁶ Sites like GBIG and Tishman Speyer report both LEED and Energy Star certifications and thus double count these attributes: because LEED uses Energy Star findings as part of its certification, it is also included in that energy figure. This operating efficiency stands as a proxy for conservation and reduced greenhouse gas emissions, although as long experience has shown, efficiency improvements do not necessarily result in conservation.

In all these things, and in other areas of greening like on-site water use and solid waste production that One Bush Plaza changed, the actual business of tenants or the office building’s owners and managers matter very little; a deep green building can house tenants deeply implicated in environmental transformation and degradation. For example, even if One Bush Plaza were still owned by a pulp and paper company, its environmental transformations would not count against the building; just as oil companies today often pursue green building certifications for their offices. It is a key scalar disjuncture among the many that arise when individual buildings are framed as a locus of environmental action. The geographical scale of buildings obscures broader supply chains, resource sheds, and notions of responsibility. Similarly, EBOM’s focus on operations presents a foreshortened temporal scale for environmental responsibility, not looking too far back

into the past to building construction or too far forward to the building's longer-term lifespan.

This scalar and functional delimitation demonstrates a broader issue afflicting urban climate change mitigation: the "urbanization" of a carbon footprint has typically meant ignoring activities beyond cities' scope or effective control. Like LEED, urban greenhouse gas emissions inventories have often ignored large-scale industrial emissions, emissions and activities located in a particular city but with operations far beyond it. This selectivity is partly a practical consideration: companies have only been responsible for reporting relevant processes at the US national level. Cities have also questioned whether it is "fair" to allocate large plants' emissions, and responsibility for mitigating them, to a specific locality, or it would penalize places for emissions over which they have tenuous control anyway.⁸⁷ As emissions from large-scale industry wash out, buildings, and the kinds of things that LEED and Energy Star track, assume a much greater share in reported urban emissions and imagined solutions.

Finally, an important way that One Bush Plaza's greening works as a market environmentalist project specifically is that Tishman Speyer has the opportunity to frame it as something that the company voluntarily initiated, should be recognized favorably for, and deserves all potential benefits from. When the USGBC asked Tishman Speyer about its impetus for greening One Bush, representatives argued consistently that the impulse came from Tishman Speyer itself. They took many opportunities in the building's narrative to advertise that the company was greening its entire real estate portfolio, and that One Bush Plaza was part of a coordinated effort. For example, its narrative locates greening as something internally chosen by the company:

Several years ago, Tishman Speyer came out with standard operating procedures that were the building blocks that led into LEED. Five to six years ago, we documented how we'd be more sustainable and each property had to create an action plan. These were rolled into the older versions of LEED and have been updated since to complement the new versions.⁸⁸

The company's framing emphasizes the existing strong performance of One Bush Plaza according to environmental criteria. Carefully overlooking the fact that it had just acquired the building, it sells One Bush Plaza's success as testament to its corporate leadership:

About four years ago, we participated in the local BOMA Earth awards contest and One Bush won first place in the city [referring here to a separate green competition run by the San Francisco chapter of the international Building Owners and Managers Association, which bills itself as the leading voice for the local commercial real estate industry]. This was a significant moment because it established us a leader and led us to decide that we should pursue more goals and achieve everything we can to be the most sustainable building here.⁸⁹

And Tishman Speyer outlines LEED certification as a broader strategy, emphasizing what a company of its geographic reach can accomplish across many urban property markets. The company frames its power as something that allows it to exert leadership and come up with innovative solutions of benefit to other developers, and of social and environmental benefit in general: its self-interest as in the interests of all, in classic hegemonic framing:

Tishman Speyer launched a LEED program across our portfolio, realizing that the LEED certification program paralleled our internal sustainability goals. As part of this, we began

*pursuing LEED certification on One Bush Street's office building and other west coast assets in the spring of 2010.*⁹⁰

*As a company, we have taken a portfolio approach, which I think is an example of a synergy. We want all of our property managers, regional engineers, project leaders and any consultants to be learning in multiple ways by doing three or four projects at the same time, learning from one another and taking different approaches to different credits... This works really well in our larger markets. We're doing this in San Francisco, Seattle, Chicago, and the Washington, DC regions.*⁹¹

*How far does our commitment to the environment extend? Soon it will reach over 49 million square feet across 4 continents... Working closely with the leading global and local organizations is essential to keep pace with the rapidly evolving sustainability movement and maintain our position as a leader in this critical area. We consistently evaluate our operations to improve our steady progress toward reducing our overall carbon footprint.*⁹²

Seeing Green: Market Environmentalism and the State in Resource Discovery

For buildings like One Bush Plaza, Tishman Speyer claims initiative on something that is in reality very much a creature of the Bay Area and California's legacies of leading environmental and energy policy. In addition to the arguably unearned benefits Tishman Speyer is able to claim from decisions made decades before it purchased One Bush Plaza, again, some of which have highly problematic histories in the city, the company is relatively coy about how much the city and state's imperatives have influenced One Bush Plaza's greening. When asked by the USGBC's narrative questionnaire what building codes or regulations influenced One Bush Plaza's certification, a Tishman Speyer representative very briefly mentions Title 24 and San Francisco LEED requirements – the only time that regulation comes up in any of this narrative.⁹³ The city and state's influence are far more important than this bare description would suggest. This tension between what entities can claim responsibility for producing greening – private actors, cities, or other levels of government – has assumed increasing significance in the current moment: as more than a matter of corporate public relations victories or evidence of political effectiveness, greening becomes a direct, appropriable, and exclusive resource and commodity.

For example, Title 24 is a major influence on the energy performance of properties like One Bush Plaza. The latest update to California's energy code was announced in 2012, with the rules taking effect in January of 2014. The CEC estimated these tightened rules would mean energy savings of thirty percent for commercial buildings, advertising billions of dollars in cost savings and millions of tons of greenhouse gas emissions averted.⁹⁴ One Bush Plaza, like many offices in San Francisco and about half of California's commercial buildings overall, was built before Title 24's energy standard was created.⁹⁵ As an existing building, it is not currently formally regulated by the code or its tightening requirements. However, that does not mean that the property has not been strongly influenced by this law, or requirements for new buildings now coming down the pipeline. As Title 24's standard has ratcheted up over the years, the "normal" level of energy performance for commercial real estate in San Francisco and California has risen. These evolving standards engage with the dynamics of modernization, obsolescence, and manufactured obsolescence in commercial property, dynamics that as discussed have long been important for One Bush Plaza and other

properties that want to maintain their Class A premium designations.⁹⁶ The evolving energy standard for new construction in California and San Francisco has put increasing pressure on companies like Tishman Speyer to retrofit their buildings if they want to protect these properties' value as assets. As the spread of energy regulations begin to impel changed standards in the broader commercial real estate development industry, and vice versa, framings of energy inefficient and non-green property as obsolescent spread rapidly in the late 2000s.⁹⁷

In the field of energy, San Francisco has done extra work to make sure properties publicly report and compare their energy performance, over and above voluntary labeling. In 2011, San Francisco began to phase in its Existing Commercial Buildings Energy Performance Ordinance, which requires commercial property owners to use the Energy Star Portfolio Manager tool to benchmark each building's yearly energy consumption. They must also have an energy audit performed every five years to identify specific energy-saving measures. This move was intended to establish a more detailed picture of energy use across the city's buildings, totals that also permit the calculation of greenhouse gas emissions per building. The rule began with the largest commercial properties (50,000 square feet and up); by 2013, it applied to all commercial properties over 10,000 feet.⁹⁸ Other cities with similar benchmarking rules now include Seattle, New York City, Austin, and Washington D.C., demonstrating how urban policies can shape broader trends in commercial property development conditions.⁹⁹

In San Francisco and California, this dynamic of evolving public codes and private property compulsions now also applies to green building in a more general sense. On top of its energy regulations, San Francisco passed a mandatory citywide green building code in 2008, laws that it applied to new construction or major renovations of commercial and residential property. The city argued that this regulation would advance its climate change mitigation commitments, a legally binding greenhouse gas emissions reduction pledge that the Board of Supervisors passed in 2002 and which the city outlined programmatically in its 2004 Climate Action Plan.¹⁰⁰ It claimed that the code would reduce 60,000 tons of greenhouse gas emissions annually.¹⁰¹ In 2010, the city pointed to these climate change commitments when California passed its own statewide green building code: San Francisco successfully argued for CEC permission to establish even more stringent regulations than the state.¹⁰² California's green building regulations became a new clause of Title 24 (Title 24, part 11; joining part 6, which is the energy code) called the California Green Building Standards Code, or CALGreen. The code includes 52 mandatory measures for nonresidential property and an additional 130 measures that are optional. The codes target improvements that include reducing water consumption, diverting waste from landfills, and improving indoor air quality. It also requires energy commissioning for all new nonresidential buildings over 10,000 square feet (for scale, One Bush Plaza totals 330,202 square feet).¹⁰³ The city and state administer these programs via public-private partnership, in this case through green certifiers including the USGBC[®]. The governments mandate LEED certification or an approved alternative for large residential and commercial buildings, a major subsidy to this brand and to the business of green labeling and accreditation more generally.¹⁰⁴

Thus, with its 2010 green certification process, Tishman Speyer was not greening in a vacuum. For example, it received points for voluntary benchmarking that would have been mandatory in a year, although even then it would likely still have received LEED

points merely for obeying the law. Nor was it a particularly early adopter of greening. Tishman Speyer’s campaign to green One Bush Plaza and the rest of its properties in San Francisco came in the middle of a major wave of greening across the city, exponential growth even in a city that was already a hotspot for LEED certification.¹⁰⁵ Growing steadily before then, LEED accreditations and related professional credentialing in the city saw a similar spike in 2007-2008 and especially 2008-2009. Total LEED-certified space in San Francisco skyrocketed in the late 2000s. The cumulative total grew from under three million square feet of certified space in 2008 to over fifteen million in 2009, and over twenty-nine million in 2010 (Figure 1). The bulk of that growth, almost ninety percent of space added 2008-2009 and a growing share every year to present, was certification of existing buildings like One Bush Plaza (Table 1). By 2013, San Francisco’s LEED-certified space totaled over sixty million square feet, over ninety percent of it EBOM. And by March 2014, total space was seventy-one million square feet and growing, in 329 separate buildings or parts of buildings. In addition, 238 buildings had been certified Energy Star[®], over seventy-nine million square feet of space.¹⁰⁶ San Francisco’s financial district, and corporate and financial property owners, dominated these totals. Almost forty percent of the LEED and Energy Star certifications in the entire city cluster in a narrow strip along Market Street, tracking San Francisco’s largest skyscrapers. Corporate real estate owners now account for forty-three percent of green projects in the city; investor owners (REITs) another twenty-eight percent. This puts non-profits and federal and local government buildings in the minority, a dramatic reversal of norms in green certification from even a few years ago.¹⁰⁷ Although certainly the late 2000s saw an important wave of private sector buy-in on the green economy, the regulatory footprint in this wave of certifications is critical.

Figure 1
Cumulative LEED-Certified Space in San Francisco 2006-2013 (sq. ft.)

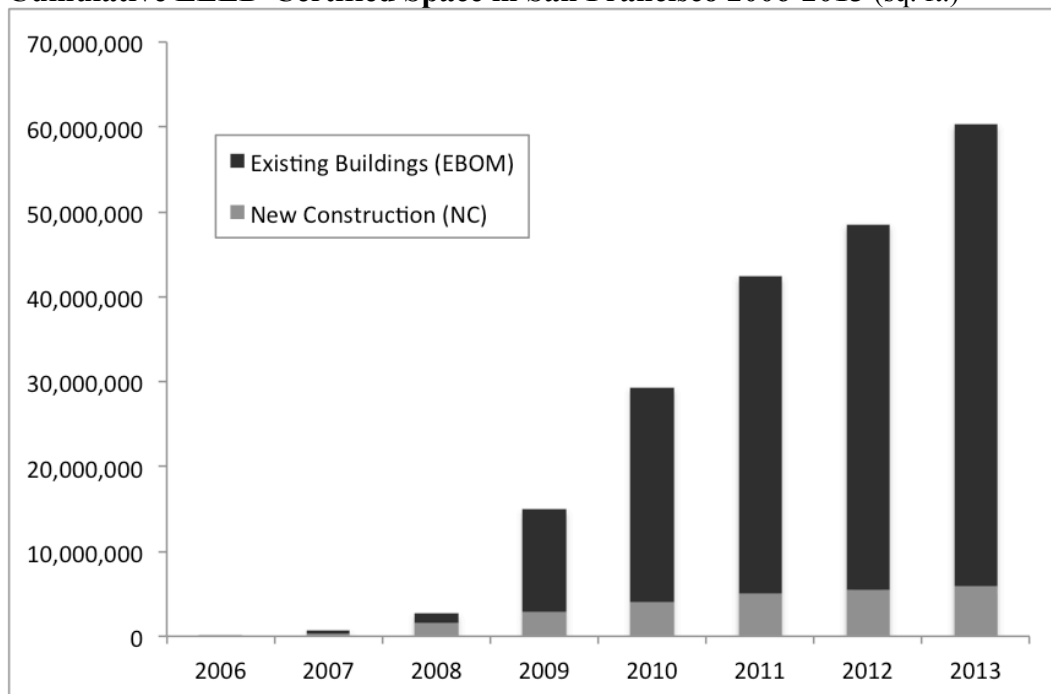


Table 1**LEED Certified Space Added Annually in San Francisco** (thousand sq. ft.)¹⁰⁸

Year	2006	2007	2008	2009	2010	2011	2012	2013
Existing Buildings (EBOM)	0	487	691	10,976	13,141	12,068	5,812	11,316
New Construction (NC)	79	115	1,326	1,352	1,176	1,015	326	468
Total	79	601	2,017	12,329	14,317	13,083	6,138	11,784

Data Source: Green Building Information Gateway (GBIG.org), San Francisco

In addition to their escalating regulations, California governmental entities have channeled billions of dollars of subsidies to building owners for energy efficiency retrofits and equipment replacement. Responding to justified fears that deregulation would disrupt utility DSM programs, the CPUC required PG&E and other investor-owned utilities to administer public benefits funds, channeling a percentage of income from ratepayers to energy efficiency retrofits and other social and environmental programs. This fund was extended after 2000; according to the CEC it was for years the state’s largest public investment in energy efficiency.¹⁰⁹ The CEC and CPUC organize programs using some of it; the CPUC also directed PG&E to form partnerships with the City and County of San Francisco and other local government entities within its service area to administer public benefits-funded programs. One in San Francisco is SF Energy Watch. The commercial buildings part of this program offers free energy assessments and financial incentives for energy efficiency upgrades (again, subsidized by ratepayers), with switches to more energy efficient equipment.¹¹⁰ Increasingly, however, administrators are moving away from these narrower device-replacement schemes to target more comprehensive building retrofits.¹¹¹ The CPUC has helped push these increasingly ambitious visions. In the aftermath of the 2001 energy crisis and with climate change on the agenda, the CPUC renewed its commitment to energy efficiency. In its policy statements and plans since 2003, it put energy efficiency first in its “loading order” for plans to meet state energy demand.¹¹²

Like many other energy efficiency efforts, the CPUC’s work boomed in the late 2000s. In 2008, it adopted a new program of activity, its *Long Term Energy Efficiency Strategic Plan*. In this statement of policy, the CPUC strengthened its commitment around energy efficiency and climate change. It observed that despite previous state work on energy efficiency, the savings were not sufficient to do their part to meet the state’s emissions reduction commitments: they had reduced the rate of growth, but total consumption had still grown.¹¹³ Among the new ideas in energy efficiency it proposed in response, it argued for ambitious designs for new construction in California. In its “big bold efficiency strategies,” it pledged to make all new residential construction net zero energy by 2020, all new commercial construction by 2030.¹¹⁴ It also significantly increased its commitment to ambitious retrofits of existing buildings. In 2010-2012, the CPUC’s statewide total investment in energy efficiency was \$1 billion per year. With the advent of the ‘Great Recession’ in 2008, the American Recovery and Reinvestment Act (ARRA) channeled an additional wave of funding into energy efficiency measures at the state and local level.¹¹⁵

Finally, in the late 2000s the CPUC and ARRA programs directed funds into preparation for what may be the most important new California legislation coming down

the pipeline on energy efficiency, climate change, and buildings, AB 758, the Comprehensive Energy Efficiency Program for Existing Buildings. The legislature passed AB 758 in 2009. It was sponsored by State Assembly member Nancy Skinner, who, prior to her election to the state government, had co-founded ICLEI-Local Governments for Sustainability and coordinated its Cities for Climate Campaign.¹¹⁶ Like the CPUC's 2008 strategic plan, the legislation and its backers argued that California could not meet its ambitious energy efficiency targets and climate change mitigation commitments without dramatically expanding energy retrofits in existing buildings. It is being gradually phased in over the next few years and will ultimately make energy efficiency retrofits for existing buildings mandatory. It enlists the CEC to carry out this rollout, in collaboration with the CPUC and other stakeholders. The first phase began with the influx of ARRA funds from 2010 to 2012, with ARRA-funded pilots subsidizing a large-scale research effort and pilot programs.¹¹⁷ The plan slated a phase of voluntary action and market development to start in 2013; a third phase, intended to start in 2015, will make those energy efficiency practices compulsory. As property owners like Tishman Speyer watch these state programs materialize, San Francisco is enacting other mandatory regulatory regulations that affect them. For example, the city established mandatory lighting retrofit legislation aimed at commercial real estate like One Bush Plaza, requirements that came due in 2011.¹¹⁸

Developers Speculate in New Resources

The slippage between private initiative and public requirement that shows up in Tishman Speyer's marketing language and this broader story of tightening governmental regulation is particularly important because greening is something that now affects property investors' bottom line. Tishman Speyer and other real estate investors and speculators are increasingly interested in greening not just for public relations benefit but for what it can mean for the value of properties like One Bush Plaza, from fear of new kinds of obsolescence to the speculative value of being an early actor in a frontier market. In other words, if there is an "unearned increment" to the green claims that Tishman Speyer now makes, it is one materialized in value and rent premiums. That investment logic begins to be evident in the language that Tishman Speyer uses to talk about its greening process. This language, first, preoccupies itself with making the greening process cost-neutral, an established line in business friendly urban climate and sustainability programs. For example, Tishman Speyer representatives present a cost-neutral argument for savings from trash diversion in One Bush Plaza, which they totaled at almost \$25,000 annually, about a fifty percent cost savings: "we've seen it in the reduction in energy use and trash hauling costs, and the bottom line is that the building is less expensive to operate."¹¹⁹ Overall, Tishman Speyer calculated that it invested \$94,000, or \$0.31 per square foot, to conduct One Bush Plaza's retrofit and to pay to certify the building with the USGBC[®]. Representatives argued that these costs were far below average, something that they claimed showed that the building was already an efficiently managed space and for which they implicitly claimed credit.

However, Tishman Speyer's framing proceeded beyond cost-neutrality into the longer term revenue-generating potential of its greening intervention: it calculated the operating costs that it averted and projected these savings into the future. The formal measurement and pricing of these savings are things that DSM programs established for

utilities in the regulated context of CPUC-approved expenditures; they are what ESCOs and new energy businesses are expanding in the current moment. Tishman Speyer's description of One Bush Plaza's commissioning process illustrates the way that commercial building owners frame these ESCO-type interventions in corporate logic, particularly how savings can become capital to be reinvested in the building or extracted:

*[Commissioning] would obtain a deemed savings of over 300,000 kilowatt hours and 450,000 kBTUs that equates to an estimated annual cost savings of over \$75,000. Many of these upgrades were low-cost or no-cost items, and the commissioning process also helped to create a capital plan for other upgrades that have a significant return and a low pay-back. One Bush has also committed to ongoing commissioning because of the value that the process has already added to the project.*¹²⁰

Tishman Speyer's more general corporate statement on sustainability presents its overall "business case," a grander statement of its vision. This narrative nonetheless openly emphasizes greening as an investment decision as much as a bid for corporate social responsibility-style brand cachet – or a greenwashing in the wake of the company's well-publicized financial debacles in the financial collapse, and revelations of its exploitive practices during the bubble. Tishman Speyer argues that its greening interventions will pioneer twenty-first century economic transformations around energy and the environment:

*Since our inception, Tishman Speyer has been firmly committed to developing and operating buildings that deliver enduring value — to occupants and local communities around the world. A critical component of our success is our approach to sustainability: we believe environmentally sound practices are simply good business. Initiatives focused on energy conservation, water reduction, waste diversion and efficient operations help to reduce our environmental impact while attracting high-quality tenants and driving down operating costs... Today, initiatives of this kind are often seen through the lens of sustainability. But, for us, they have always been smart business practice. Actions to use renewable energy, recycle building materials, reduce waste and conserve water are grounded in economic decisions to help reduce our operating expenses and mitigate energy price risks. Simply put, we follow sustainable practices in every one of our properties because sustainability builds value.*¹²¹

The dimension of speculative investment to this strategy can be seen more clearly in Tishman Speyer's language on One Bush Plaza. In another statement of its motivations for pursuing LEED certification, the company strips its language of "value" from the slippery feel-good connotations of social and environmental utility that it takes on in the last quotation to a more bare bones statement of property exchange value. The company's representatives make it clear that they intend greening to make the property more competitive and to increase its rents, value, and overall profitability. When asked for keywords, they summarize the company's motivations as, "cost/utility savings," "market competitiveness," and "organizational priority." In another summary statement, they argue:

One Bush Street (along with other west coast assets) began pursuing LEED certification to accomplish three main goals:

- 1. To reduce overall impact of operations on the environment*
- 2. To create a more positive and enjoyable working environment for our tenants*
- 3. To increase profitability of our asset.*

*These three goals were set by Tishman Speyer as an organizational priority. They were set because Tishman Speyer realizes that through these goals, it will increase the competitiveness of its assets through creating working environments that tenants want to be in, and at the same time, it will create operational efficiencies, such as reduced water and energy costs.*¹²²

This motivation is critical in Tishman Speyer's broader real estate portfolio. The company keeps overall statistics on its LEED-certified space, certifications by other international green building standards, and Energy Star labeling. It also track greenhouse gas emissions across its real estate portfolio, something without direct value in some sectors but potentially linked into emissions trading and other market climate policies in others.¹²³ Although it is possible to find arguments that California's cap-and-trade market should lower its mandated emissions floor for regulated businesses to allow large commercial properties to participate directly, this direct carbon market regulation and speculation has been an unlikely sell.¹²⁴

Tishman Speyer, One Bush Plaza, and even San Francisco are not alone. In the wake of the 2008 collapse, LEED and Energy Star certifications have taken off, some for new buildings, many this kind of retrofit of existing urban space. According to McGraw-Hill Construction, the major publisher of construction industry information, by 2011 the value of all LEED building (including homes) in the US was \$78 billion; they estimated that it made up 44 percent of commercial and institutional construction last year. And it projected the market to triple to high as \$248 billion by 2016. Reports on the global green property market estimate even higher growth rates: 780 percent growth in square footage between 2010 and 2020, and with particular concentrations in places like China and India.¹²⁵ Projections of more targeted energy efficient construction and retrofit markets are similarly bullish. Looking particularly at ESCOs, Pike Research estimates a global residential and commercial market of \$236 billion by 2020.¹²⁶ Language about the profitability of green property encompasses but also goes beyond the specific streams of savings targeted by ESCOs: what is happening now is the formal creation of value within real estate markets, and the production of greened properties as having premium value within these markets. Subsequent chapters will explore how real estate trade literature and scholars have worked to produce this value in a notoriously herd effect-prone, speculative industry.

I will argue that these efforts cannot be distinguished from simultaneous work to make properties like One Bush Plaza financial assets, and from the broader financialization of real estate markets in San Francisco and other economically powerful cities in the late 2000s. As REITs gain power in these urban property markets and global companies like Tishman Speyer develop twenty-first century investment visions, they are framing greening as a major speculative strategy. Returning to the processes of property transformation and financialization surveyed above, and particularly the new geographies of resource discovery and extraction that they demonstrate, I will argue that these powerful economic players are now putting greening to work for the ongoing expansion of finance and financialization, in increasingly central ways. Investment banks, funds, and other financial industry players are working to transform energy efficiency interventions and green properties into bases for new kinds of financial instruments and assets, new kinds of resources to power their own accumulation. The actors surveyed here are part of this process.

For example, Tishman Speyer advertises its participation in the Global Real Estate Sustainability Benchmark (GRESB) Survey, a tool that surveys publicly traded REITs and private funds run by companies like Tishman Speyer for investment in sustainable properties. Major institutional investors use the tool to target green portfolio investment. In 2011, seven of Tishman Speyer's real estate investment funds earned GRESB's Green Star designation, for scoring better than 50 percent in environmental performance (i.e., performing better than their peers).¹²⁷ The National Association of Real Estate Trusts (NAREIT), the association that represents US REITs, now works with GRESB to track and recognize sustainable investment.¹²⁸ The USGBC also entered the field in 2013. It partnered with NAREIT and FTSE Group, a subsidiary of the London Stock Exchange that provides stock indices, to create a green property index, FTSE NAREIT USGBC. With this index, the USGBC aims to go beyond the industry's preexisting reliance on voluntary disclosures. It will independently score a set of REITs commonly used as a benchmark for US real estate for their green investment, measured as the relative value of their real estate portfolio that has been LEED certified or received an Energy Star label.¹²⁹ The last few years has also seen the creation of real estate investment funds that specifically target green properties, instruments that make direct bets on these buildings increasing in value.¹³⁰

Cities Seeing Green

This kind of value logic does make attempts by companies like Tishman Speyer to benefit from California and San Francisco greening policy look like another way in which property owners are appropriating urban environments for unearned gain, an extension of the everyday dynamics of urban land markets and speculation in urban property value: generations of rentiers have benefited from the value conferred by human congregation without creating this condition. However, examining the way that San Francisco's government frames the regulations in which it is embedding buildings like One Bush Plaza illustrates how comfortable the city's government is with the kind of framing that Tishman Speyer uses: i.e., its focus on a cost-positive and property value-focused version of greening. For example, San Francisco advertises greening to commercial property owners using the same kind of language put forward by Tishman Speyer: "building improvements...can lower operating costs, guard against energy price escalation, enhance building value, and increase visibility and competitiveness."¹³¹

This kind of urban government framing begins to indicate the willing complicity of San Francisco and California governments in the kind of market environmentalist strategies advanced by Tishman Speyer, even potentially its downplaying of states' own role. The role that the state and local state is taking here has often been one of regulation for the benefit of property and in the interests of property value: whether as a gambit for persuading property owners to go green or because it is fully converted to the market environmentalist line is difficult to tell.¹³² This logic pervades policies like AB 758, which sells itself as a market transformation program. Although that policy will have regulatory teeth beyond its initial voluntary, stakeholder-oriented promotional phase, even as a regulatory strategy it is one aimed at making businesses more competitive. It sees energy efficiency improvements as unachievable without this kind of business internalization, and perceives no real conflict in the proposition that businesses could come to see improved energy efficiency, even radical changes, as in their self-interest. A

green economic development line is part of the program: it aims to promote workforce development and green collar jobs creation.

Particularly, AB 758 has focused on developing and promoting new ways of appraising value, and new financial instruments for harnessing that value. Marked by a pervasively expressed need to make influxes of cash in ARRA and other government funds work as a leverage point for expanding private investment, it is opening up a major market gap for interested financial engineers and investors to step into. Instruments here are specifically focused on energy savings: property assessed clean energy (PACE) and utility on-bill repayment (financing) schemes have received major attention, but other models are in the mix as well. And, notably, much of the financing here depends upon mass-market aggregation of loans from many different properties, a similar model to the one that animated subprime lending and other financial experiments in property-backed debt in the 2000s.¹³³ The state is thus putting its seal on the potential creation of a major financial market backed by its policies, is directly funding some programs (e.g., PACE, before that instrument ran into federal opposition from Fannie Mae and Freddie Mac), and inviting finance in as an expert in shaping the development of this field: a curious position given ongoing scandals of finance's involvement in the 2008 economic collapse.

In this dimension, local governments like San Francisco represent a new version of an old urban political strategy: an urban growth machine that acts to bolster property values, in collusion with local elites. Green growth machines are focusing on the link between property values and greenness, and considering how to promote it. This kind of policy is popping up in San Francisco now, and becoming more common in other US cities.¹³⁴ For example, the San Francisco city tax assessor's office is starting to report green premium value for homes, attempting to establish new real estate appraisal mechanisms that can see, and create, the economic value of green.¹³⁵ And in a new expression of its growth machine role, SPUR is using these green initiatives to promote job creation and ongoing economic competitiveness in San Francisco, boosting the city as a special hotspot for jobs related to green building, energy auditing, and green financial services development.¹³⁶

The city is even taking up the financialization of this vision. San Francisco itself is developing financing products that provide windows for third-party finance. For example, San Francisco is promoting a Commercial PACE as part of its greening work. This quotation from the city's promotional materials indicates the tone of these efforts:

Under San Francisco's commercial PACE program, "GreenFinanceSF," property owners can secure 100% financing from an investor of their choice, and repay the cost of the upgrade over time through a special line item on their property tax bill. The PACE structure, which builds on decades of land secured financing experience, offers familiarity and security to project investors, enabling financing at lower rates and longer payment periods than traditional commercial loans...San Francisco is using federal grant funds to cover administrative costs for participants for a limited time. Additional grant funds are being used for a debt service reserve fund that can cover delinquent payments to investors; this additional security may result in more favorable financing terms and rates, and broaden access to capital.¹³⁷

Supporting financialization is a full goal of the state, as discussed in the CEC's scoping report on AB 758: a perceived necessity for the scale and expense of the changes needed to retrofit large swathes of California's existing built environment and to meet its

broader climate change goals. However, this public-private trend has major potential costs. Its logic promotes the urbanization of climate change as a call and opportunity for the expansion of urban financialization, and the turning loose of conjoined real estate and financial speculation in a new sphere. This financialization of climate change policy, and its close connection with real estate development, will be important in twenty-first century urban politics.

Toward a Conclusion

The dynamics at work in San Francisco in the late 2000s have parallels in other world cities. They also have echoes across other landscapes of resources and property. This chapter has introduced many players and dynamics that will come up again in the dissertation, from ESCOs and big data approaches through green real estate investment and green urban growth machine politics. In the chapters to come, I will further explore these new forms of value and discovered resources, the interests combining to bring them into being, their contradictions, and what those contradictions are likely to mean. Bringing the story full circle, Crown Zellerbach's old competitors the Potlatch Corporation and Weyerhaeuser reorganized themselves as timber REITs in 2006 and 2009; Weyerhaeuser now bills itself as a top-twenty US homebuilder.¹³⁸ These strategies have opened up other fields of land and property speculation globally. The early twenty-first century saw a massive global run on developing farmland, water rights, and other unconventional property markets for major investors, the results of which research is describing as a wave of social displacement, dispossession, and environmental degradation: a highly ironic outcome given the "green" investment arguments running through this grab.¹³⁹ The engineers of this ongoing land and resource grab are now working to develop new investment vehicles like farmland REITs, aiming to harness financial tools worked out in San Francisco and other cities to expand new global frontiers of resource extraction and environmental transformation.

Chapter 2: Resource Geographies in a Green Economy

Energy efficiency offers a vast, low-cost energy resource for the U.S. economy...if the nation can craft a comprehensive and innovative approach to unlock it...if executed at scale, a holistic approach would yield gross energy savings worth more than \$1.2 trillion, well above the \$520 billion needed through 2020 for upfront investment in efficiency measures.

- McKinsey & Company (2009)

In July 2009, the global management consultant McKinsey & Company published a report entitled *Unlocking Energy Efficiency in the US Economy* (McKinsey and Co., 2009).¹ The result of a research process that the firm initiated in 2008, the report advertised itself as a new way of looking at energy efficiency. It acknowledged that efforts to make buildings, appliances, materials, and management practices more energy efficient have a decades-long history in the US, from roots in the environmental activism, countercultural visions, and energy crises of the 1960s and 1970s, through often-ignored governmental and utility efforts in the decades that followed, to a renewed wave of public interest provoked by the threat of global climate change and new ideas in green economic development.² This energy efficiency advocacy aimed, like the McKinsey report, to promote upfront energy saving measures as a supplement and alternative to the construction of new power plants, fossil or renewable. But McKinsey's authors also promised something new. They argued that past efforts had not gone far enough to assess the dollar value of savings that large-scale energy efficiency measures could generate across the US economy, the barriers to this massive new market, and solutions for overcoming those obstacles. McKinsey's estimates are the product of dozens of decisions (at least). The report's authors made choices about the time window of the analysis; what measures were rapidly deployable³ (the focus on existing technologies itself a decision, since analyses might choose, as McKinsey did not, to include more nascent interventions and technologies); the relative magnitude of each measure's energy savings; the market value of these savings; the likelihood, form, and effectiveness of climate change legislation, and many more questions. All are boiled down into the deceptively simple, easily disseminated totals presented in the quotation above.

As suggested by the tenor of that statement, McKinsey's authors promised an assessment of possibilities framed in language that mainstream business could understand. Their approach was marked, for example, by a focus on "NPV-positive" interventions. The concept of "net present value (NPV)" embodies a perspective that considers not just the upfront cost of energy efficiency improvements and the expected payback time of these investments given predicted energy prices (and potential changes to energy prices that climate change legislation might introduce), but also the cost of capital. That is, the potential for alternate investments forsaken by investment in any one particular thing. This financial opportunity cost is represented by a discount rate, seven percent in this case.⁴ This kind of investor's analysis pervades modern business thinking. However, the report's authors sell it as a different way of looking at energy efficiency. They contrast their method with more traditional approaches such as a technical assessment of the potential of different available technologies that is more independent of

cost, or an ambitious account of how advanced future technologies might reshape energy use and greenhouse gas emissions.

Critically, and in line with its direct appeal to business and to the economic potential of this environmental intervention, the McKinsey report framed energy efficiency as a *resource*. It argued that streams of energy saved, and energy costs saved, over time deserve equal status with conventional energy resources, despite the added level of complexity required to create and enforce this more difficult commodity.⁵ As the next chapter will show, McKinsey did not originate the idea that intangible, speculative energy savings into the future could be deployed and quantified as a “thing” and assessed against energy generated in power plants: Amory Lovins and other 1960s and 1970s era critics of the US energy system introduced these visions. However, the McKinsey report has been significant in a reemergence and revolution in these ideas in the late 2000s. The quotation above demonstrates one framing of radically new market opportunity in a report pervaded by similar statements. Throughout, the authors used the concept of energy efficiency as a resource to conceptually unify many different actions undertaken in many different places. In their account, these measures constitute a common national market. Their presentation of massive net economic potential has done important discursive work, as has their framing of the potential of social and political organization as an object with nascent value, a real thing already out there existing in the world. Like an undiscovered mineral deposit, they framed energy efficiency as a vein of riches as yet “untapped” by capitalist investors.

McKinsey’s resource language around energy efficiency speaks to a broader movement around new resources and the green economy, one that gained major prominence in the late 2000s. This chapter, and the three that follow, explore this wave of activity. The discussion centers around the idea of new resources and new resource “discovery” processes, a project of market-making institutions like McKinsey that has been of intense interest to geographers. As I will discuss, many of these new resources have emerged attached to concepts like ecological modernization, ecosystem services, and the green economy. In these fields, resource discovery has drawn on programs of frontier use value and exchange value, the “internalization” of economic externalities, in neoclassical economists’ sense, and the creation of new market regimes for environmental regulation. Although most existing geographical analyses of these new resources have looked to the rural peripheries that have been traditional centers of resource extraction, the current research joins an emerging wave of scholarship that follows resource creation bids like McKinsey’s into more unusual resource geographies: cities, the built environment, and high tech clusters; industrial and (arguably) “post-industrial” spaces. Companies like McKinsey, and the type of financialized capitalism that they inhabit and embody, have been critical in generating this expansive new geography.

A New “Resource Geography”

Among Merriam-Webster’s multiple definitions for an ambiguous concept, the dictionary calls a resource “a place or thing that provides something useful” and “a natural source of wealth or revenue.” Definitions range from more individualized notions of usefulness to

the kind of universalized market recognition and pricing that the McKinsey report targets. In this sense, definitions begin to engage value theory, fundamental concepts from the classical political economy of Smith, Ricardo, and Marx. After being largely abandoned in the neoclassical revolution in economics, these concepts are being reinvigorated in contemporary mainstream thought by questions of the value of nature.⁶ Territorial states' interest in resource acquisition and national economic development creeps into these mainstream definitions: i.e., "something that a country has and can use to increase its wealth."⁷ So too does the sense that resources are things able to be surveyed and counted: resources as "computable wealth."⁸ Geography's history as a discipline is deeply embedded in these kinds of state projects of resource surveying, mapping, and enumeration, often carried out in service to colonial programs of extraction.⁹ A more critical contemporary discipline of geography has taken on today's boom in new resources as a pressing area for investigation.

The tools that contemporary geography is developing to analyze new resources owe much to the discipline's close relationship to political ecology. With related bodies of scholarship in development studies, anthropology, and environmental history, these fields interrogate the workings of power in processes of environmental change. One of their most significant contributions has been to analyze how corporations, financial institutions, and other powerful political economic players contribute to resource degradation. They have also examined how these actors shape political economic programs organized in the name of global resource conservation, environmental sustainability, and climate stabilization.¹⁰ Over the last three decades, these scholars have formulated critical accounts of resource discovery and extraction. They have examined the disposessions, political destabilizations, and environmental degradation that produce "resource peripheries." Many of these investigations root themselves in critical development studies. They elaborate upon on world systems ideas, dependency theory, and other post-colonial thought to track neo-imperialism in resource extraction and to map the enduring development challenges that resource peripheries face. They take up and complicate concepts like the "resource curse" and ideas of the "frontier." They consider extractive regimes' complex global, regional, and local dynamics, as well as their trans-scalar politics (Peluso, 1992; Peluso et al., 1994; Peet and Watts, 2002; Watts, 2004; Tsing, 2005; Redclift, 2006; Robbins, 2011). They analyze how the dynamics of extractive, cultivative, and productive systems differ (Bunker, 1984; 1996; Boyd et al., 2001) and consider *longue durée* processes of resource discovery, extraction, and abandonment in search of new frontiers (Moore, 2000). And they investigate traditional commons-based resource management, resisting the current hegemony of ecological privatization-as-conservation arguments (Ostrom, 2000; Agrawal, 2001).

This rise of market environmentalism in the 1990s and 2000s provoked a new wave of critical geographic and political ecological scholarship. The new school of environmental management that neoliberal institutions introduced, strongly influenced by Coase (1960), advocated the rollback of "command and control" environmental regulation of pollution and resource industries. It introduced a new regime of more "flexible" pollution control, characterized by voluntary action on the part of business, public-private partnerships, free choice of methods for meeting pollution quotas, and pollution markets and trading schemes. These environmental regulatory experiments have created new tradable "commodities" including sulfur dioxide emissions, greenhouse gas

emissions, and wetlands. Influenced by models like Garret Hardin's "Tragedy of the Commons" (Hardin, 1968), neoliberal resource management schemes privatized commons (Mansfield, 2004). In market creation visions given strength by the publication of the Millennium Ecosystem Assessment (2005) and the longer term development of environmental economic and ecological economic thought (Costanza et al., 1997), advocates maintain that pricing natural processes in this way will help sustain them; that these systems would be exploited in worse ways without this "internalization." Gómez-Baggethun et al. (2010) present a history of these ideas. At their most ambitious, as in the Millennium Ecosystem Assessment, these visions propose the formal economic enclosure of all ecosystems and biophysical processes.¹¹

This wave of thought, and the policies that it has engendered in the US and Europe, has prompted many critical scholars to apply a political ecology lens to "First World" forests, rangelands, wetlands and waters, and environmental regulatory structures. Fortmann (1996) and McCarthy (2002) represent early contributions in this push to translate lessons learned in developing country contexts to other geographies. Studies now follow the travels of neoliberal environmental ideas among diverse places. Heynen et al. (2007) survey this "neoliberal natures" work as it has developed. In the US and European context, it builds on older critical accounts of land privatization and enclosure, state modernization projects, and industrial environmental transformations. Geographers and their colleagues in this growing field have critiqued new market environmentalist schemes along several fronts. For example, they have charged that neoliberal era changes in places like the US have weakened existing environmental laws (e.g., Prudham and McCarthy, 2004). This critique is common to other areas of neoliberal rollout; geographers including Harvey (1989), Peck and Tickell (2002), and Hackworth (2007) have chronicled attacks on Keynesian and embedded liberal welfare states in realms including public housing and welfare policy.

Critical scholars have also examined the new forms of value and commodities that market environmentalist schemes propose. They ask how these programs create new kinds of resources and resource geographies, and they investigate the problems generated by such schemes. Going beyond Costanza et al.'s ideas of formal valuation, new resource discovery programs have sought similar kinds of "untapped value" as the 2009 McKinsey report describes for energy efficiency. For example, a representative passage from the Millennium Ecosystem Assessment argues, "nonmarketed benefits are often lost or degraded. These nonmarketed benefits are often high and sometimes more valuable than the marketed ones" (Millennium Ecosystem Assessment, Summary, p. 6). Critics often emphasize how these frontier accumulation visions abstract from and founder upon complex material realities. These critiques draw on work in the sociology of finance and ecological economics as well as in geography and political ecology. Researchers including Robertson (2006), Lohmann (2005, 2009), Mackenzie (2009), and Gómez-Baggethun et al. (2010) have examined the labor of framing complex ecological systems as simplified, exchangeable quantities, and they have analyzed ways in which unruly natures confound this simplification. They argue that failed enclosures can overturn market schemes predicated upon their successful manipulation and can degrade the ecosystems involved.

Contemporary studies often draw on analytical accounts such as Polanyi (2001 [1944]).¹² Polanyi analyzes earlier European histories of environmental market

construction, necessary to produce land as an alienable commodity. Via his idea of land as a “fictitious commodity,” he criticizes attempts to collapse complex socio-environmental relationships into simplified, manipulable objects. He argued that such attempts to assimilate land (which implicitly includes more concrete processes of ecosystem reproduction) to the erratic demands of markets will ultimately prove impossible, and will be ecologically destructive in the attempt. Historical accounts like Cronon (1983) have pursued similar arguments.¹³

Scholars of “neoliberal natures” have developed extensive critiques of how the opaque quantitative framings put forward by institutions like McKinsey have been deployed in market environmentalist schemes. Market advocates maintain that ecosystem services surveys and valuation exercises allow them to “internalize” environmental costs and find substitutes for environmentally degrading practices. A common critique of this vision is that the new markets abstract from complexities inherent in the natural systems that they attempt to enclose. Thus, their rollout may further degrade these already-destabilized ecologies. Among a wave of such studies (Benton, 1997; Heynen et al., 2007; Lohmann, 2005; 2009), Mackenzie (2009) critically analyzes greenhouse gas emissions trading and offset schemes, McAfee (1999) and Fairhead et al. (2012) make this kind of critique with regards to REDD¹⁴ and Payment for Ecosystem Services programs, and Robertson (2006) discusses issues arising in wetland banking and trading schemes. Related scholarship has considered privatization and market creation initiatives being rolled out in fisheries and forest management (e.g., Mansfield, 2004; McCarthy, 2005).

This charge of radical simplification is not the only critique that geographers and political ecologists have leveled at market environmentalist schemes. Increasingly, critics examine the work of land and resource appropriation that these efforts do, whether or not they fulfill environmentalist promises. Critics have argued that, like other frontiers of neoliberal practice, market environmental schemes accumulate through dispossession. In other words, according to Harvey’s (2003) formulation, the economic surplus these schemes extract does not stem from real economic growth, the value dynamics of labor and technological rents associated with industrial production. Instead, these schemes’ surplus comes from enclosure, appropriation of socio-natural wealth from “outside” the existing industrial capitalist system. Scholars have examined land “grabs” as a critical dimension of this process.¹⁵

Geographers and political ecologists have examined land takings for new resources,¹⁶ and how “green” dispossessions join continuing land appropriation for mining, timber, and plantation agriculture (McAfee, 1999). Several have implicated carbon offsets more specifically (Bumpus and Liverman, 2008; Shapiro, 2010). Most recently in the wake of the 2008 financial collapse, researchers tracked a wave of massive agricultural land buy-ups funded by finance capital, agrochemical empires, sovereign wealth funds, and other elite actors. Some have called this wave a “green grab,” noting the prominence of biofuel plantations and carbon offsets in these transfers (Cotula, 2012; Fairhead et al., 2012). Although much of this analysis has concentrated on rural land in developing countries, work commissioned by the OECD (HighQuest Partners, 2010) and scholarship such as McMichael (2012) has shown that new land buy-ups encompass property in industrialized countries. They survey major price increases and land consolidations in farmland in the US Midwest, as well as land rushes for mineral

extraction rights in the North American boom in unconventional natural gas and oil extraction.

However, market environmentalism has not restricted itself to these resource peripheries, in either developing countries or rural parts of industrialized countries. It is now pursuing a range of fronts that include core countries, cities, and industries. For example, industries of consultants and financiers have grown up around market-based climate policy, schemes that include but are not limited to offsets. Cap-and-trade systems in California, other coalitions of US states and Canadian provinces, and the European Union have important industrial dimensions; even if the search to ease these places' regulatory pain has been marked by efforts to find offsets and outsides. Critics argue that speculative capital has already blown up and burst several bubbles around carbon regulatory markets, including markets in industrial greenhouse gas emissions (MacKenzie, 2009; Haya, 2010; Rosenthal and Lehren, 2012).¹⁷

Moves to follow market environmentalism beyond conventional resource frontiers have been advanced by the growing field of urban political ecology. A more recent offshoot of First World political ecology, its scholars initially focused on urban metabolism. As can be seen in work like Heynen et al. (2006) and Kaika (2005), urban political ecology has worked to destabilize the persistent myth of cities' "unnaturalness" and a tendency to analyze them as self-enclosed systems disconnected from broader environmental flows. Scholars have taken on the task of remapping forgotten interrelations and hybrid natures. Accounts have explored how cities have been constructed out of the stuff of nature and out of the pooled surplus extracted from broader geographies of industrial development; transformations at once economic, social, and environmental. Operating these urban assemblages and reproducing social life within them demands continual incoming, internal, and outgoing metabolic flows of energy, water, living and dead life, physical materials, and waste – ever greater and more transformative as cities grow ever larger. Global climate change and other looming environmental destabilizations make this kind of reenvisioning increasingly urgent. In US cities, these accounts complement an earlier tradition of work in urban environmental history and environmental justice. Notably, in its current form this scholarship has not gone much beyond the overall scale of the city and its infrastructure: it has not thoroughly engaged the buildings or the social and economic activities within interior space. The current research aims to advance this arena of scholarship.

Urban political ecology has also incompletely engaged more political economic work within political ecology. However, it opens up space for considering the deregulation and privatization of electricity, natural gas, and water utilities.¹⁸ In the US, the rollout of neoliberal policies included campaigns to deregulate these utilities, as well as telecommunications (Harvey, 2005). For example, Graham and Marvin (2001) argue that restructuring created increasingly fractured and unequal urban service networks. In developing countries, structural adjustment programs often advocated selloffs of public utilities (Goldman, 2005). In the US, energy service companies (ESCOs) companies including Enron sold this deregulation as opening up new economic space for private energy efficiency companies. As scholars critiqued these schemes, they laid intellectual groundwork for more fully integrating energy and energy efficiency into geographic and political ecological analysis, in ways that go beyond a focus on either oil extraction or the troubled rollout of greenhouse gas emissions trading schemes.

Scholars including McCarthy (2002) and Gómez-Baggethun et al. (2010) emphasize that new resources are connected to broader ideas of ecological modernization (e.g., Mol and Spaargaren, 2000). In other words, market environmentalists argue that economic “internalization” will help engender techno-social innovations to conserve and develop substitutes for natural resources. This ecological modernist line promotes unconventional resources as a source of value, a way for new high tech industries to generate technological rents.¹⁹ Like McKinsey (2009), high tech entrepreneurs and financiers propose that clean technology and the green economy can mean massive potential markets if political and technical obstacles are overcome. In the process, they may make themselves indispensable to governments proposing massive investments in climate change mitigation and resilience. Thus, the urban and industrial interventions invoked in green economic visions propose to bring market environmentalism closer to core capitalist processes.

Researchers must determine whether the application of these ideas to energy and greenhouse gas emissions-intensive industrial economies and urban centers can support a different mode of accumulation than the exploitative one pioneered in more conventional resource peripheries. This question means further engaging with work in political economy as well as political ecology.²⁰ Environmentalist challenges to ecological modernism have argued that it is too wedded to an economic growth imperative; i.e., that energy efficiency gains, material efficiency improvements, and other “dematerialization” cannot go far enough to counter ongoing growth in an expanding global economy. Acknowledging those critiques, I suggest another politically important diagnostic: whether processes of green resource discovery and nominally green economic development are engendering real economic growth or accumulation by dispossession.

New literatures begin to be relevant in this type of analysis, from big picture formulations of geographical political economy (Harvey, 1982; 2003; Storper and Walker, 1989) to more specific sectoral studies. For example, investigating energy efficiency as a resource requires, among other avenues of inquiry, analyzing built environments and processes of real estate development. It demands investigation of new connections between markets - real estate, environmental regulatory, and energy - and how these interconnections transform the workings of each. These dynamics reignite theoretical questions about urban land rents, capital switching, and connections between capitalist development and urbanization asked by urban and economic geographers in the 1970s and early 1980s. In the wake of the subprime collapse, a new generation of urban economic geographers and political economists have taken up these debates (Walker, 1974; Harvey, 1982; Haila, 1988; Bryan et al., 2009; Christophers, 2011).

These new questions require a creative resource geography. The field must build on the traditions surveyed here. It must consider new resource discovery and extraction processes as not just parallel programs but interconnected ones. For example, Bridge (2010) constructs a life-cycle picture of petroleum that ranges from extraction to consumption (Huber, 2009, and see Zimmerer, 2011). Work like Bakker and Bridge (2006) and Bridge (2009; 2010) has advanced contemporary resource geography, and reconnected it with earlier contributions such as Walker (1979). New studies are considering the blurry boundaries between high tech and today’s resource extraction frontiers, intensive and extensive (e.g., Mulvaney, 2013b). They track how high tech industries formally enclose new forms of value and maintain connections with resource

extraction zones. A new program for this work must be to engage these relationships in more depth: how economic players are taking up different “green” sectors, transferring market design schemes and financial instruments between places and kinds of green markets, and, overall, developing new geographical strategies of resource extraction. In other words, critical scholarship must track how powerful global players are seeing the world, discovering its potential resources, assessing and mapping them, exploiting them, and persuading others that new kinds of things have value and can support accumulation.

Geographies of “New Resources”

Returning to McKinsey’s work in expanding these new resource frontiers provides illuminates how the field is developing. First, it is significant that the firm’s 2009 report was able to gain so much influence so quickly. It would be a research project in and of itself to track this diffusion beyond the repeated references that it has provoked within business-minded energy efficiency forums like the American Council for an Energy Efficient Economy’s (ACEEE) Energy Efficiency Finance Forum, business school presentations on the green economy, and a wide range of green economic policy documents. But following the travels of its published numbers and observing the works citing it reveal some of this mobility. For example, as of March 2014, the McKinsey report’s citation count was 119, almost a hundred more published references than major energy efficiency analyses like the American Physical Society’s summary report on energy efficiency, released a year earlier (APS, 2008).²¹

Interestingly, McKinsey’s history as a firm shares roots with modern efficiency thinking. Both arose during the Progressive Era. McKinsey was founded in 1926 as a “management engineer,” one product of the cachet that the engineering profession attained in the 1920s. It joined a broader outpouring of efficiency experts, from pioneers of industrial Taylorism to Lillian Gilbreth and her household time-and-motion studies. Efficiency experts aimed to eliminate waste along many dimensions, a structure of feeling that also shaped environmental conservation and the emergence of neoclassical economics. Nye (1992) discusses how this culture of technocracy, including the literal Technocracy movement, similarly shaped the early history of the electric power industry. This line where engineering, mainstream economics, and energy and environmental thought converge has major salience today. Then as now, quests for efficiency have left economic growth basically unchallenged. Concerns about the limitations have intensified in more critical tracks of environmentalist thought today, as advocates of steady-state economics and de-growth challenge efficiency and energy, resource, or emissions intensity metrics as real measures of environmental harm averted.²² McKinsey rebranded itself as a “management consultant” in the late 1930s.

McKinsey’s contemporary interest in new resource frontiers extends beyond its interest in energy efficiency. In 2014, the lead headline on the firm’s main website proclaimed a “Resource Revolution,” asking “is increasing demand for natural resources an opportunity or a threat? For true innovators, there is only one answer.”²³ The firm advertises a series of McKinsey reports and books that sell energy and environmental innovation as a massive twenty-first century economic opportunity. Exemplary arguments include statements like: “technological advances can not only improve

resource productivity dramatically but also spark the next industrial revolution.”²⁴ Critically, McKinsey has staked a broader claim on defining the “business” of climate change mitigation. McKinsey released its first climate change report in 2007. An important feature of this report was an economy-wide abatement curve that ranked different climate change mitigation options from most to least expensive, with “low hanging fruit” that included carbon offsets, a decision that proved controversial with environmentalists.

A major wave of media attention in 2011 demonstrated the power McKinsey exerts in these new green resource frontiers, the character of that power, and major concerns over it. In that year, environmental organizations including Greenpeace UK accused McKinsey of making critical errors in its climate change analyses, specifically around the carbon offset schemes included in the UN Framework Convention on Climate Change’s REDD program (see a summary of these debates in Bock, 2014). REDD structured carbon offset allowances around avoided deforestation. These critics argued that McKinsey’s baseline for measuring avoided deforestation was flawed in important ways, ones that resulted in logging companies being able to claim carbon offsets while maintaining, and even increasing, deforestation rates. They also argued that the way McKinsey constructed its cost curves, i.e. calculations of the relative costs of different emissions reductions, made it seem far cheaper to displace subsistence farmers than to halt the spread of large-scale plantations. Larger scale critiques of McKinsey cost-curves argue that they promote offset projects as least or lower cost relative to more significant emissions reductions like energy efficiency retrofits or renewable energy generation. Beyond the political questions involved in these distinctions, critics question whether those low offset cost estimates are accurate given the on-the-ground difficulties forestry schemes have faced so far.

These methodological flaws assumed major significance when countries including Indonesia and Papua New Guinea retained McKinsey as a consultant in their climate change mitigation programs. These specific critiques are in line with political ecologists’ more general critiques of offset projects, i.e. that setting baselines and counterfactual scenarios is a process rife with indeterminacies, ones that can make them fundamentally unworkable (Lohmann, 2005; 2009; Mackenzie, 2009; Haya, 2010). Further, it exemplifies the fears of academic commentators like McAfee (1999) and Fairhead et al. (2012) that these schemes can nevertheless transfer funds to logging companies and, paradoxically, bolster fresh land takings and environmental degradation. Interestingly, with its energy efficiency market-making McKinsey has staked a claim on the other side of this critique as well.

An illuminating further claim in this controversy was environmental advocates’ charge that McKinsey’s unwillingness to disclose its data and methods of analysis constituted a major problem in and of itself. The consultancy has long been known for its secretiveness. Although McKinsey alumni would write influential business books like *In Search of Excellence* (Peters and Waterman, 1982), the company’s internal procedures have been kept murky – a practice that the company claims is in its clients’ interest. This claim, although only some of this secrecy, was shaken in the late 2000s when McKinsey’s former managing director and another senior partner were accused of insider trading. The Galleon scandal emerged amidst ongoing turmoil and scandals within finance and the apparatus of higher echelon business and financial services: an

unsurprising time to find public opinion skeptical about practices even at a famously staid and technocratic firm like McKinsey.

More pointedly, critics argued that this lack of transparency compromised programs meant to be public policy, in line with other complaints about the anti-democratic potential of managerialist climate programs (Swyngedouw, 2009). This discomfort is exemplified in stories that powerful delegates at the Cancun Conference of Parties meeting had pushed developing countries to hire McKinsey as the firm (at a discount as far as McKinsey is concerned), countries could signal their efforts' legitimacy to international donors. Environmental advocates argued that this power gave the consultancy an inappropriate degree of control over developing countries' policies. Critiques of this technocratic anti-politics of expertise echo criticisms of the World Bank, an institution with which McKinsey has long had a relationship (Bock, 2014). Bock argues that it has become usual practice for developing countries to hire global consultancies to signal to donors that they are good investments.

Rumors of McKinsey's high-level access at Cancun were broadly plausible because of the broader power of the consultancy and its relationship with global institutions. McKinsey now operates 104 offices in 60 countries worldwide and boasts that two-thirds of Fortune 1000 companies are its clients.²⁵ It is a well known training ground for CEOs. According to the *Financialist* (2013): "McKinsey has long been considered the "corner office" consultant – the one that gets called in for the really important strategic decisions." Today, its clients include not just corporations but the city of New York under Bloomberg. The company's public reports, with publications like *Harvard Business Review*, are important influences on business thought in the US and globally.

The public plausibility of McKinsey's power at Cancun also testified to the firm's strategies in the contemporary moment, notably, its move into the "public and social sector." News stories about the 2012 US Presidential elections were rife with stories of management consultancies and their influence. Both Barack Obama and Mitt Romney reportedly engaged consultants to map their campaign strategies (Leonhardt, 2011, the *Financialist*, 2013). It is in this context that Bloomberg's New York took on McKinsey as a consultant.²⁶ Scholars now engage this trend through work on policy mobilities. They investigate how governments, especially urban governments, formulate policy programs. They also follow the travels and mutations of particular policy measures and financial instruments, and the role of global institutions in impelling this movement. Researchers such as McCann and Ward (2011) point to the role of global consultancies like McKinsey and professional services firms including PriceWaterhouseCoopers (other "big four" auditors include Deloitte, Ernst & Young, and KPMG). Firms may popularize particular tools and concepts through direct client relationships, or via setting the broader structural terms under which cities define their identities and evaluate themselves against competitors. For example, the McKinsey Global Institute advertises its Urban Performance Index (UPI), as a tool that "allows cities to benchmark themselves against their international counterparts on four critical criteria: economic performance, social conditions, sustainable resource use, and finances and governance."²⁷ This comparative, competitive framework has become increasingly important to cities in a context of neoliberalism and globalization. Urban administrations have been forced to compete for

investment with increasing intensity, especially because that investment has become ever more mobile and globalized (Harvey, 1989; Hackworth, 2007).²⁸

McKinsey's relationship with the World Bank is especially significant here, as Bock (2014) points out. As the World Bank sought to transform itself into a "knowledge bank" in the 1990s (Goldman, 2005), it increasingly embraced the program of making new markets, the same kind of role that McKinsey has adopted with its work on energy and resources. In other words, the Bank has aimed to advance new technological and geographic frontiers for capital accumulation. It has advanced this program in its investments and relationships with the financial establishment, but also through its broader power to define new accumulation visions and enlist capital behind these programs. Late 2000s moves have built on an earlier "greening" of the World Bank (Goldman, 2005). Goldman, Wade (1997), McAfee (1999) and Hart (2001) argue that this green neoliberalism became central to strategies to reconstruct the Bank's embattled hegemony after the debt crises, anti-dam movements, and anti-globalization protests of the 1980s and 1990s. They also maintain that it attempted to blunt the radicalism of Third World environmental activism.

McKinsey's own power to make markets speaks to broader trends in the contemporary world economy. Although McKinsey is the largest of today's global consultancies, it operates in competition with rival management consultants including Bain and Boston Consulting Group. The global rise of these giant firms is an important phenomenon in and of itself. It also speaks to broader reorganizations of the capitalist world-system – since World War II, and in the neoliberal era. McKinsey locates its own history in the post-war expansion of US corporations in Europe, what Fred Block calls a "multinational bloc" of US capital.²⁹ McKinsey's corporate story narrates how it facilitated this midcentury globalization.³⁰

These companies, and the United States-dominated First World order that they inhabited, fell under increasing strain beginning in the 1960s. As many scholars have chronicled, the rise of neoliberalism meant a shake-up in the echelons of US business. Established corporations, McKinsey's traditional clients, lost luster. New kinds of firms rose to take their place. In the financialized capitalism that grew up over the last thirty years, consultancies like McKinsey and Bain became famous as instruments of corporate downsizing and layoffs. And consultancies themselves grew as an economic sector and diversified their lines of business. Scholars are beginning to examine these institutions and their global role (Ho, 2009; Larner and Laurie, 2010; McCann and Ward, 2011). Following Goldman in developing methods for global institutional ethnography, they investigate how this transnational elite performs the actual work of globalization. This program can mean unifying spaces and creating shared cultures and expectations. As discussed in terms of cities, it can also often mean disciplining places and enforcing "creditworthiness," as increasingly mobile capital demands intercomparability and interchangeability among global sites of investment.

The Financialization of Resource Discovery

Neoliberal era financialization has shaped this global capital mobility, the rise of McKinsey and other advanced business services, and the drive by McKinsey and the World Bank to discover unconventional resources. Besides Keynesian and embedded liberal governments' relationships with a bloc of rising, often multinational corporations, a critical component of the Keynesian order at midcentury was a particular negotiation with and disciplining of finance. In the precursor to this order in the late 1920s, the US financial system had been awash in capital, some from its late nineteenth century industrial rise, some fleeing the political turmoil and monetary instability of interwar Europe (Block, 1977; Kindleberger, 1984). However, by the mid-to-late 1920s, the US's ability to find productive outlets in which to sink this capital had stalled. Speculators instead sunk it into a frenzy of corporate, railroad, utility, and skyscraper stock bubbles (Goetzmann and Newman, 2010) and a range of "secondary circuit of capital" real estate developments and schemes (Walker, 1977, pp. 485-6; see Harvey, 1982 for more abstract theorization of this circuit-switching). When these speculations failed broadly in the Depression – and likely helped hasten its coming (Goetzmann and Newman, 2010) – the financial system risked collapse.

In this troubled era, major banks cast their weight in with the New Deal economic coalition. The New Deal-Keynesian state saved capital in general from devaluation, speculating that its infrastructure investments would reestablish accumulation on a new and higher basis postwar: part of a US strategy to prevent the return of Depression conditions that also included the Marshall Plan and the rollout of other development policies. These programs aided the US multinational industrial bloc as well as the country's balance of payments (Block, 1977). This era of New Deal-Keynesian capital controls and financial regulation muted longer-term tensions in the relationship between productive capital and finance, and between governments and finance.

As much as periods of patient capital investment can be demonstrated to have been essential to the ongoing reproduction of capitalism, they can simultaneously be unbearable burdens to individual capitals, particularly finance capital. Capital at rest or uncompetitively invested is capital devalued, and capital(ists) outcompeted. Harvey argues that investors' compulsion to escape fixed capital investment into more liquid assets drives omnipresent threats of geographical creative destruction. He tracks this in capitalism in general – i.e., the *longue durée* geographical shifts, industrialization, and creative destruction analyzed by Storper and Walker (1989) and Arrighi (2010) – and in the breakdown of the Keynesian financial order.³¹ By the 1960s, international finance was straining at the bit of decades of capital controls, and financial centers like London and New York led the way in pushing for the removal of these regulations.

Financial institutions and financial centers helped push a breakdown in US domestic banking regulations, international capital controls, and the gold-convertible US dollar as global reserve currency, cornerstones of the Keynesian financial order. US and British governments also came to promote these transformations, and through them the continuing dominance of New York-Wall Street and London-The City as world financial centers. Financialization increasingly influenced these governments' political economic strategies (for surveys, see Block, 1977; Helleiner, 1994; Strange, 1998; Gowan, 1999; Sassen, 2001; Brenner, 2006, 2009; and Eichengreen, 2008). With the rise of German and

East Asian competitors, these states faced a worsening crisis of global overproduction and stagnating domestic profitability. Groups threatened by this geographical transformation – and by the neoliberal transformations that US and UK governments eventually initiated in response – included US industrial sectors that had been global leaders in the mid twentieth century, organized labor, and growth coalitions in cities fighting disinvestment (Brenner, 2006).

Major transformations of the neoliberal era have included the massive growth of institutional investors and the financial industry in general, as both a share of US Gross Domestic Product and in absolute terms. Investment banks have proliferated complex, computationally intensive financial products, in part to serve an increasingly risk-differentiated fund market. Financial logics and the language of creditworthiness have spread in many spheres. Economies have been rocked by increasing volatility and crisis. Analysts have called all of these trends “financialization” (Henwood, 1998; Gowan, 1999; Clark, 2000; Laulajainen, 2003; Krippner, 2005; Bryan and Rafferty, 2007; Lee et al., 2009; Wójcik, 2011, 2012).³² A now-vast critical literature on neoliberalization has chronicled how finance capital acquired increasing ability to discipline other actors to its accumulation imperatives as it gained influence over many sectors of productive capital, centralized and federal state systems including cities, and a mounting population of non-elite laboring debtors. Through its own private power and neoliberal-era ideological dominance within national states and Bretton Woods institutions, finance has continued to shape legal and regulatory geographies in its favor; further dismantling capital controls, imposing fiscal austerity programs, and privatizing public assets including water and electric utility systems. By the time the 2008 crisis hit, the dominance of financial logics of accumulation had progressed to such an extent that industrial corporations (LiPuma and Lee, 2005; Brenner, 2009; Christophers, 2010) and growing numbers of states had created quasi-financial arms – the latter via the sovereign wealth funds that have received major attention in contemporary global land transfers.

Wójcik (2012) describes contemporary finance as characterized on one hand by a “supply side” that US investment banks (and now bank holding companies) and the few European mixed banks continue to dominate on the global level. He argues that although these banks continued to perform corporate service functions in the neoliberal era (for example, managing mergers and acquisitions, underwriting stock issues, and strategic consulting), securitization drove their most dynamic growth.³³ Driven by fierce competition and spurred on by their ability to exploit increasingly sophisticated techno-computational facilities, they created a vast variety of novel financial products (Henwood, 1998; LiPuma and Lee, 2005; Bryan and Rafferty, 2007). Important among them were the supposedly homogenized mass instruments of asset-backed securities. These financial assets often took real estate-based forms of residential mortgage-backed securities (MBSs), commercial MBSs, securities backed by other assets, and collateralized debt obligations (CDOs) that sliced and repackaged these other asset classes. In the 2000s, investors from all over the world bought into this property-based debt, and the (ultimately insecure) US and European mass wealth viewed as backing it.

Critical analyses performed during the subprime mortgage bubble and in the wake of its collapse (Fox-Gotham, 2006; Aalbers, 2009; Brenner, 2009; Newman, 2009; Wyly et al., 2009) have tracked how banks used these origination powers to create securities backed by unsound assets, single-family home loans to US debtors whose ability to pay

had been decimated by increasing raced and classed economic insecurity (see Wyly et al. 2009 on the on-the-ground predatory lending practices that underlay these abstract financial instruments). Tracking loan-to-originate practices, researchers explain how banks profited from fees via this practice despite the unsound nature of the assets in question. Although they passed on many of these unsound securitized assets to buyers worldwide (Brenner, 2009; Sassen, 2009), some financial institutions duped themselves in the process, holding these deceptively highly rated assets on their own books as part of their required capital-asset ratios. Not all these mortgage instruments were backed by subprime loans, but the broader economic malaise and real estate downturn that struck US and European countries took them out nonetheless. This collapse of key investment banks' balance sheets was a critical factor in late 2000s failures and near-failures, mergers and reorganizations, and resulting industry concentration.

Complicating this picture of investment banks and their “financial engineering” drives, Wójcik (2012) argues that, on the other hand, research must not neglect a critical “demand side” in the modern financial industry. Echoing Leyshon and Thrift (1997), Clark (2000), and others, he emphasizes the rise of massive institutional investors in the neoliberal era. Basic assets that these funds invest in include bonds, securities, and other financial assets (Laulajainen, 2003). Wójcik argues that these investors' steady and mounting demand for assets was a key driver of the neoliberal era proliferation of financial products. For example, US pension funds becoming a major and growing source of demand for new securities – for assets for their portfolios, as investment models replaced pay-as-you-go systems after 1980. Like finance in general, large institutional investors buy into common models of risk-return balance and consequent asset pricing (Laulajainen, 2003). Simply put, higher-risk assets carry a higher rate of return, rooted in creditors' ability to extract higher interest rates from more speculative ventures and more vulnerable debtors. Institutions accept common risk ratings from ratings agencies, from secure “investment grade” assets to high-risk, high-yield “junk” bonds. However, risk ratings have mean different things to different types of institutional investors. Funds have different structural risk tolerances, self or shareholder-directed. Government regulation plays a role in the form of controls of permissible leverage, how far an institution can speculate beyond its pool of assets.

Institutional investors like hedge funds occupy the higher-risk-tolerance end of the sector. The hottest of this “hot capital,” hedge funds invest in high-risk ventures but expect very high returns and a short-term investment horizon. Private equity funds have become a critical player in the wake of the financial crisis. They provide high-risk, high-return investment vehicles for other institutional investors like pension funds and for wealthy individuals. These high risk funds have traditionally been the province of the wealthy and as such have been permitted to remain highly opaque and unregulated. Contemporary bank investment banks, bank holding companies, and mixed banks can manage their own institutional investment funds or buy into others'. As characterized by Laulajainen (2003), these actors play a common role on the frontiers of capital accumulation. Fund managers claim that their expert management of pools of wealth can beat average stock exchange return for a given period, although this claimed expertise has historically provided no necessary success.

More conservative actors account for a major share of total institutional investment assets under management (Clark, 2000). These asset managers critically

include public-private institutions charged with managing employee pensions (in the United States especially, a source of security increasingly important as many have lost the central economic security provided by single-family homeownership and home equity). Despite the theoretical point of their origins in labor's surplus, these institutions must structurally follow the kinds of capitalist logics presented by Harvey if they want to preserve and expand the accumulated capital that they manage. However, they are simultaneously constrained in doing so by their social function: they are committed to providing stable returns over the long term. Regulators typically protect this role by constraining pension funds from investing in assets that have below-investment grade ratings. Although often treated as somewhat different kind of actor (e.g., Laulajainen, 2003) insurance and reinsurance companies similarly maintain long-term investment portfolios in addition to income from clients' premiums; their changing real property investment strategies demand more attention. Sovereign wealth funds now join this group of investors likely to adopt more long-term, conservative strategies. According to the International Monetary Fund's *Global Financial Stability Report* (IMF, 2012), pension funds face profitability squeezes post-subprime. Johnson (2012) tracks their resultant entry into higher-risk activities; as with subprimes and other contemporary financial frontiers, framed in terms of ever-increasing expert and technological capacity to manage risk.

Gowan (1999) and others have noted that finance often came out of pre-subprime financial crises with its systemic power and geographic centers paradoxically strengthened. We can find evidence of maintained financial power in bailouts after 2008 and subsequent state austerity programs. As in the past, observers have tracked capital flight to security in the crisis, defined in terms of type of asset and place (e.g., to and from US Treasury bonds amid continuing Eurozone challenges). This dynamic has reinforced existing centers like Wall Street. However, finance has not remained unscathed by the protracted recession and crises that rocked many powerful economies in the late 2000s. The IMF (2012) reports a more structurally serious concern even than institutional investors' endemic profitability challenges and riskier investment strategies. It forecasts a more basic scarcity of "safe" assets today, the kind of secure, low-risk investments needed for conservative institutions' bread and butter wealth maintenance and to leverage more speculative activity. The IMF states that this scarcity derives from the 2008 collapse of privately produced investment grade assets – again, including a range of asset-backed securities taken down by unsound assets. According to the IMF, US and European private issuance of these instruments collapsed in their financial crises (although far more precipitously in the United States). In 2011, new issuance was still a fraction of earlier 2000s levels. This sudden lack left institutional investors worldwide scrambling for replacements to avoid devaluing their capital.

Compounding this problem, US and European sovereign public debt, the more traditional safe asset left in the aftermath, suffered shocks amid the post-collapse aftermath of persistent recession, financial and political volatility, and serial threats of sovereign and federal debt crisis. Similar post-collapse crises have swept US state and municipal bonds (Bullock, 2011; Bullock and van Duynne, 2011), another asset that wealthy, long-term investors had considered very secure. These injuries are self-inflicted, a consequence of previous waves of neoliberal era financialization. This financialized accumulation by dispossession gradually extracted surplus from the structures that

Keynesian regimes had constructed – and on which finance’s own reproduction came to depend: workers’ savings, mass homeownership, stable municipal fiscal structures, secure national debt. Ironically, post-collapse regulations have simultaneously raised required collateral requirements, requiring even higher-risk actors to hold more of these dwindling safe assets. The IMF report warns of serious resulting risks to the global financial system:

The tightening market for safe assets can have considerable implications for global financial stability...as investors scramble to attain scarce safe assets, they may be compelled to move down the safety scale, prompting the average investor to settle for assets that embed higher risks. In an extended period of low interest rates and heightened financial market uncertainty, changes in investors’ risk assessment of the safety features of assets could lead to more frequent short-term spikes in volatility and the potential for a buildup of asset bubbles (IMF, 2012, p. 83).

Troubles in capitalism’s twentieth century commanding heights are an important factor in work by McKinsey, the World Bank, and other market-making entities to define new resources. For example, their casting around for unconventional resources helped provoke crisis-era land transfers, the “grabs” and “green grabs” discussed by Fairhead et al. (2012) and others. Researchers have followed overaccumulated capital fleeing the subprime collapse into agricultural commodities speculation in 2007-2008 (Ghosh, 2010; Van der Ploeg, 2010). Expecting price appreciation in the land upon which these crops were grown, investors instigated a particularly massive rush of large-scale land acquisitions in 2009 (Cotula, 2012; McMichael, 2012).³⁴

Of major interest in this account are the language and instruments that institutions like the World Bank and McKinsey use to blow up unconventional resources. To answer this question, we may follow McMichael (2012) and others by examining increasingly endemic language of “yield gaps,” and parallel framings of financial experts’ unique ability to fill them (e.g., World Bank, 2007; FAO, 2010). Researchers now identify similar arguments in many sectors. For example, subprime mortgage lending’s yield gap framing argued that technological and computational revolutions in risk spreading allowed financial institutions to tap a historically underserved market, the economically insecure. Shiller (2003) extended this sense of unfulfilled market opportunity beyond home lending, arguing for the broader “democratization of finance”: how the financialization of everyday life could act as a new form of insurance.

Microfinance’s yield gap framing makes a similar argument vis-à-vis the Global South’s “bottom billion” (Roy, 2010).³⁵ These arguments resemble the language that McKinsey uses to frame energy efficiency as a resource. They also parallel the discourse that McKinsey (2009) and other market-making institutions are using to frame a “financing gap” in energy efficiency and urban climate change mitigation (e.g., World Bank, 2010; Merk et al., 2012).³⁶ Like unconventional green resources – energy efficiency and its future streams of energy savings, greenhouse gas emissions averted – financial instruments are intangible commodities. Furthermore, debt-based financial instruments similarly are products given value because they embody the promise of future streams of return. Like energy efficiency in general, boosters like McKinsey present energy efficiency *finance* as an existing market merely waiting for banks, new financial companies, and funds to exploit it. These common patterns provide one indication of how critical financial players may be in in what “counts” as a resource

today, and how green economic visions are feeding the expansion of a new wave of experimental financial products: to “unlock” this value, as McKinsey claims, and to harness it for accumulation.

Toward a Conclusion

Future chapters will take up this analysis by querying where new resource industries are deriving their surplus: whether an actually existing green economy generates real economic growth and satisfies at least some ecological modernist hopes, or whether it continues the speculations and accumulation by dispossession that have plagued carbon markets. The former might support a new techno-organizational epoch in capitalism, one that proposes to maintain socio-environmental reproduction – and profitable economic growth – in the face of twenty-first century environmental transformations. The latter suggests the narrower, short term, and far less ambitious accumulation strategies that have characterized a neoliberal system: upward wealth redistribution, financialization, and increased volatility, with growth in the real economy uneven and often fleeting – let alone growth with Keynesian redistribution.

Chapter 3: Making Energy Efficiency a Resource

The twentieth century witnessed revolutionary transformations in human generation and consumption of energy. It saw petroleum and natural gas rise to challenge coal's long dominance within fossil fuel exploitation, the construction of massive electric power plants – including truly titanic dams and hydroelectric power systems – and nation-spanning electric grids, and a utopian and dystopian embrace of the potential of atomic fission. It observed the writing of new rules to organize complex, dangerously powerful natural phenomena into domesticated concepts such as voltage and current. In the United States, it oversaw the creation of influential economic and regulatory fictions such as “natural” monopolies for energy utility companies. And, in perhaps the most profound achievement of the era's politicians, utilities, engineers, and manufacturers, the twentieth century witnessed these radical breaks become mundane, a scarcely perceived framework structuring everyday life in industrialized countries (albeit a markedly geographically uneven phenomenon, as many in the Global South can still attest). This chapter explores early twenty-first century efforts to forge a similarly revolutionary change: to make energy *saved* a resource on par with any other source of energy. In it, I argue that the late 2000s marked a turning point in thinking on energy efficiency and conservation, one that in the United States saw major political attention and private investment. In the wake of the 2008 financial collapse, a wave of new businesses sought to harness the value of energy savings for profits. They advanced an optimistic appraisal of market potential that echoed the language of institutions like McKinsey & Co., as discussed in the last chapter. Green enterprises in the sector ranged from building retrofit companies to advanced materials producers and “smart” information technology startups. In this discussion, I reconstruct the historical developments that produced this efflorescence. I also briefly consider contradictions emerging in this new green economic sector.

The chapter begins by investigating the late twentieth roots of this thought in the United States. In the late 1960s and 1970s, environmentalist and counterculture movements generated a profound challenge to the large-scale utility system, nuclear ambitions, and the imperatives of ever-growing energy production and consumption that drove both. In the energy crises and economic turmoil that wracked the 1970s, energy efficiency and conservation went mainstream: governmental agencies and utilities cast around for ways to manage energy demand as well as to provide power and fuel. This search became bound up in social welfare imperatives, as federal programs like home weatherization were founded to help low-income households save money on climbing utility bills. Ultimately, energy efficiency also became bound up in the political economic turmoil that swept the decade: the return of cheap energy prices and the rise of neoliberalism in the 1980s prompted a near-total abandonment of energy conservation in political discourse. Nonetheless, I argue that 1970s beginnings initiated an ongoing legacy of public programs. Federal agencies, national laboratories, non-governmental organizations, and progressive utilities and state-level regulatory agencies – notably in California – organized despite insecure congressional funding and popular apathy at the national level. They conducted ongoing technical research and produced political tools including energy efficiency codes for new appliances and buildings, voluntary efficiency labels, and strategies for retrofitting buildings for improved energy performance. These

public efforts laid critical groundwork for a renaissance of interest in energy efficiency and conservation.

I argue that the US's checkered experience with the deregulation of energy utilities in the 1990s has been an equally important influence on today's moves to make energy efficiency a resource. In the 1990s, California rolled out strategies aimed at making energy markets a more "exciting" economic space. It passed legislation deregulating its utility energy system, radically altering structures for electricity and gas delivery that had served investor-owned utilities since the political struggles of the Progressive Era and helping spark similar moves in other US states. Deregulated energy markets created opportunities for new competitors in the field of energy and power generation, and in the broader realm of energy services provision. I argue that for energy efficiency, these transformations generated a process of resource discovery. They helped create private sector enterprises like energy service companies (ESCOs) that priced not just energy sold but energy *not* sold, and translated these streams of savings over time into a business model. Despite deregulation's problems, including the 2001 California electricity crisis and the revelations of market manipulations behind it – notably by Enron, itself a pioneer of the new energy services – ESCOs, and the broader business of making energy efficiency a resource, saw a second boom in the late 2000s.

I suggest that in the late 2000s, arguments for energy efficiency drew new force from mounting concerns over anthropogenic climate change. Efficiency advocates have worked for years to position conservation as a greenhouse gas reduction solution that deserves at least as much attention as renewable power, and that is far more viable than schemes such as carbon offsets, a renewed push for nuclear power, or geoengineering. However, I argue that the most critical influence on the timing of the late 2000s boom was a rejuvenated political mandate after the 2008 financial collapse. The newly elected Obama Administration radically refunded energy efficiency programs such as weatherization and expanded their mandate: in the administration's visions of a green economy, energy efficiency interventions would not only save energy and assist households beleaguered by the Great Recession, they would also drive economic recovery, technological rejuvenation, and "green collar" jobs creation – federal ambitions that I discuss at greater length in Chapter 7. Finally, the late 2000s renaissance in energy efficiency enlisted new kinds of supporters such as historical preservationists. As the new players highlighted embodied greenhouse gas emissions and the life cycle energy and emissions costs of building and demolishing cities, they further strengthened arguments for retrofitting and conserving existing urban landscapes.

After tracking the production of this idea of energy efficiency as a resource, I examine what is being done with the new resource today: particularly, how it is being harnessed in the creation of new financial instruments. I also assess developing contradictions in these economic practices. Measurement and verification of energy savings poses one such challenge. Assessing value gained from energy efficiency interventions has long been a complex and problematic process. As market creation and financialization demand more precise calculability, they have worsened the problem. Another major challenge comes from the temporal and geographical scaling of energy efficiency interventions, notably building retrofits. Retrofitting efforts face increasing pressure to calculate the life cycle energy and greenhouse gas emissions costs of buildings and their construction. Awareness of embodied energy and emissions can

indeed support long-term maintenance of built environments over abandonment and demolition. However, programs to sustain urban environments fundamentally clash with the cyclical patterns of construction and disinvestment that characterize property markets in modern capitalism.¹

New Thinking on Energy

In the United States, new ideas about energy efficiency, and the potential of energy efficiency as a resource, rose first in the public sphere. As I discuss in this section, they were animated initially by environmental activism, particularly responses to nuclear disasters and oil spills. They also represented broader environmentalist organization against the modernist growth imperative that drove expanding nonrenewable energy production and consumption. As discussed in Chapter 1, this movement took various forms, from direct action to the alternative technology imaginaries of the environmentalist counterculture. In the energy crises of the 1970s, ideas of energy efficiency and conservation took national stage, although they became negatively associated with a Carter-era tone of moralism and sacrificed comfort. In the 1980s, energy conservation fell from favor. Energy efficiency programs suffered funding cuts and uncertainty over their future, and national political discourse largely ignored the role that efficiency and conservation might play in meeting energy needs. However, these ideas continued to evolve within a specialized public technocracy, comprised of federal governmental institutions, progressive states and public utility commissions (PUCs) like California's, and non-governmental organizations, notably the American Council for an Energy Efficient Economy (ACEEE) and the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).² Public programs pioneered building energy codes and techniques for residential weatherizing, repairing and retrofitting low-income homes to conserve energy. Despite the obstacles these programs faced, they helped create a group of contractors and professionals who specialized in this niche kind of building auditing and repair. Federal appliance codes and voluntary Energy Star labeling created additional business producing advanced building materials, appliances, and equipment. And, critically, public programs prompted utility demand side management (DSM) and decoupling initiatives.

Environmentalism, Energy Crises, and Conservation

Progressive commentators have long called for the United States to expand its energy efficiency and conservation efforts. Although we can find earlier roots for energy efficiency thinking in the Technocratic movement of the first part of the twentieth century, modern calls have roots in 1960s and 1970s-era critiques of ever-increasing energy production and consumption.³ These critiques took form in major environmentalist campaigns against the rollout of nuclear power and in reaction to specific events like 1969 Santa Barbara oil spill and the partial nuclear meltdown at the Three Mile Island power plant in 1979. Their form was shaped by the broader context and strategies of the environmentalist movement as it rose in the 1960s and 1970s. Activists pioneered strategies ranging from direct action to innovation legislative campaigns and environmental litigation.⁴ In California, they pioneered the modern use of

ballot initiatives as a tool of direct democracy and organizing.⁵ These tactics solidified around the passage of key pieces of legislation in 1970, the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). These pieces of legislation set norms around environmental impact assessment and disclosure and formed bases for future litigation.

In the context of anti-nuclear power campaigns, and broader resistance to the US's nuclear buildup during the Cold War, influential thinkers like Amory Lovins proposed new ways for the country to think about energy provision. Lovins emphasized the potential of distributed generation, energy efficiency and conversion, and other less centralized, capital-intensive, and potentially dangerously undemocratic technological paths.⁶ Lovins' call for a "soft path" approach to energy was embedded in a broader green countercultural context that included back-to-the-land movements, appropriate technology, and environmental localism and regionalism. This thought encompassed a sometimes-uneasy combination of neo-traditionalist practice and technological futurism, a tension that continues to play out as green building becomes mainstream practice. For example, these conflicts manifested in the simultaneous rediscovery of traditional materials and building practices and in research into advanced building materials and systems.⁷ As Chapter 1 discussed, the countercultural strand of environmentalism most influential in the development of green building and energy efficiency practices was friendlier to high tech development and even to a capitalist growth imperative than other parts of the movement.⁸ This line of thought has exerted growing power over the environmental movement as a whole, including thinking on energy.

Questions of efficiency and conservation acquired special urgency amid the energy crises of the 1970s. In that decade, many public entities committed to investigating alternative sources of energy supply. However, as energy efficiency fell out of favor with the return of cheap oil and energy prices more generally, critics caricatured these efforts as moralistic failures. They slammed the lecturing tone and doing-without pessimism of Jimmy Carter's framing of the crisis. They particularly cited an infamous televised speech in 1977 that aimed for the style of Franklin Delano Roosevelt's famous "fireside chats." In it, Carter promised an 'unpleasant talk' about energy realities while wearing a cardigan to signify that the White House thermostats had been turned down. Along with subsequent Carter pronouncements on inflation and US economic "malaise," this line of thought came to symbolize for many the country's problems in the 1970s. Despite the enduring set of environmental and geopolitical issues these discussions raised, the general public eagerly forgot alternate thinking on energy in the 1980s, as new energy exploration and oil industry maneuverings ushered in a return of cheap energy and neoliberal policies unleashed a speculative economic frenzy.⁹

Energy Codes and Labels

Despite the reputation they acquired, 1970s energy efficiency initiatives were never simply moralistic exhortations. Rather, they created an important legacy of public research and technical experimentation that has built throughout the last thirty years, efforts that laid the groundwork for today's renaissance. In the United States, much public research on energy and buildings occurred under the aegis of the Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) and in the national labs, in conversation with research non-profits like the ACEEE and industry

standards bodies like ASHRAE. Tightening energy codes for new buildings and equipment have formed a major part of that initiative. The DOE has set mandatory national standards for appliance energy efficiency since 1978 and has progressively included more kinds of energy equipment.¹⁰ Code tightening produced major operational efficiency improvements in light bulbs and consumer appliances; larger heating, ventilation, and air conditioning (HVAC) systems such as boilers; and building materials including windows. US federal structure devolves to states the power to determine building codes, including energy codes. However, since 1992 the DOE's Building Energy Codes Program has promoted national model codes for residential and commercial buildings and provided states technical assistance in implementing them.¹¹ Not all states comply. Some, like California, organize a separate energy code generation and updating process, and potentially a more stringent one; others have had no residential energy codes at all.¹²

The federal government has also developed voluntary market-based programs to promote energy efficiency, a process that has helped generate buildings and technologies that go above standard and created technologies that can replace less efficient or deteriorated systems in existing buildings. The DOE's Building Technologies Program now works with the US Environmental Protection Agency (EPA) to run the Energy Star building label. The EPA initiated this voluntary certification scheme in 1992 under the Clinton Administration, aiming to improve energy efficiency and reduce greenhouse gas emissions. The program originally focused on appliances, proposing to incentivize innovation by equipment producers and to create a new green market for products that significantly exceeded the DOE's operating efficiency requirements. The agency gradually expanded Energy Star to cover major building equipment like heating, ventilation, and air conditioning (HVAC) system elements. The DOE became involved in 1996, when the program was expanded to score whole buildings and label them for exceptional energy performance.

Weatherization and The Birth of Energy Efficiency Retrofits

The federal government also took up the idea of retrofitting buildings to conserve energy, specifically in the form of home weatherization programs for low-income households. In a separate effort with the US Department of Health and Human Services (DHHS), the DOE has operated home energy weatherization programs in all US states since 1976. These programs propose to reduce energy use needs by sealing cracks, installing insulation, and otherwise repairing and improving buildings.¹³ The federal government first initiated home weatherization during the energy crises of the 1970s, critically motivated by concerns over the mid-1970s cost of home heating oil. These programs aim to help households reduce their spending on energy, basic livelihood costs that make up a far greater proportional share of working class expenditures than those other income groups (Berry et al., 1997). More specifically, the DOE developed the Weatherization Assistance Program, framed around the goal of national energy conservation, while the DHHS's broader Low-Income Home Energy Assistance program (LIHEAP) contained a Weatherization Assistance component more explicitly justified in terms of aid to low-income households. Both agencies' programs depend on congressional appropriations.¹⁴ Federal formulas for allocating weatherization funds between states are based upon a combination of the population of low-income households, climatic differences, and

energy use. With this federal government sponsorship, state and local agencies implement the assistance programs. Permitted spending per household has varied over time and by place (DHHS programs accorded states more decision-making power over their policies); in practice, the majority of funding has been channeled through the DOE program and followed its evolving rules (Smith and Richardson, 1989; Berry et al., 1997). Finally, many utilities also dedicate some resources to low-income assistance programs, although historically these funds' existence and level has varied by state, often dominated by states with public utility commission-mandated weatherization. Utilities have also typically stuck to smaller appliance replacements, leaving larger interventions for federal programs.¹⁵

The theory animating low-income weatherization was that since poorer households' energy bills were likely to be particularly high relative to their overall income, energy efficiency retrofits would bolster their economic welfare and that of their communities (Berry et al., 1997; Schweitzer and Tonn, 2003). This intervention was particularly critical in the 1970s, as energy prices climbed amidst other strains including stagflation. Enduring problems present themselves here with the way that the federal government handles homeownership, particularly as opposed to its programs directed toward working class renters or public housing inhabitants.¹⁶ Weatherization spending was a direct giveaway to homeowners specifically, and formed part of a suite of US programs that have preferentially subsidized mass (white) homeownership since the midcentury.¹⁷ However, it also bore important similarities to renovate-in-place arguments advanced by racial and economic justice activists as alternatives to the blight designations, eminent domain seizures, and bulldozing that came out of midcentury urban renewal programs (Self, 2003).¹⁸ Investment needed to ameliorate general building disrepair, mitigating "blight," overlapped with some of the building structural interventions necessary to lessen energy efficiency-relevant deterioration.

Analyzing the DOE's Weatherization Assistance program as part of a series of Oak Ridge National Lab meta-evaluations conducted of the program's activities and results in the 1990s and 2000s,¹⁹ Berry et al. (1997) found that the program had weatherized about 5 million homes since its 1976 creation; by 2009, this number had increased to 6.3 million (EERE, 2009). In a home weatherization project, energy auditors survey the existing building to see where it is leaking energy – out of cracks in building seals, leaking or obsolescent windows, and insufficient insulation. They also examine major appliances for potential upgrades to more efficient versions, or look to smaller-scale repair and efficiency-improving changes, like insulating pipes. Light bulbs are the easiest technology to replace outright, whereas refrigerators, water heaters, and other large appliances are the most intensive. In general, there are upward limitations on the energy savings obtainable or economically feasible in existing structures: even given funds for more extensive remodeling that weatherization typically affords, existing homes cannot be redesigned from scratch for high energy performance. (Although depending on the original vintage of construction, older homes can contain passive heating, cooling, and ventilation features that make them relatively efficient.)

To dig a little more deeply into this picture, for residential buildings that have been a central part of weatherization programs, analyses such as Deason and Hobbs (2011) track basic breakdowns of current residential building energy use in major US regions. Space heating is by far the most important energy sink in the Northeast and

Midwest; air conditioning becomes more significant when the South and West are included. In general, this space conditioning is the largest source of demand for energy in US homes, as EERE (2008)'s national averages show; water heaters, refrigerators, and other appliances are important but generally lesser energy consumers. The centrality of heating and cooling in energy use explains why so many weatherization interventions target leaks in the building seal, windows, and other points of connection between interior and exterior space. According to Berry and Schweitzer (2003), DOE weatherization implemented in natural gas-heated homes reduced these households' energy use by an average of 22 percent (and gas consumed for space heating by 31 percent); weatherization of electrically heated houses reduced electricity use by 10.5 percent (electricity used for space heating by 27 percent). This assessment estimated total national energy savings of 29.1 million British Thermal Units annually.²⁰

Berry et al. (1997) track how the degree of allowed building intervention changed over time in the DOE's Weatherization Assistance program. Besides allocated funding per house, they examined how substantial the building envelope repairs permitted were, what percentage of funds was required to be spent on materials, and whether or not the replacement of building systems or major appliances was allowed. In its early days during the 1970s energy crisis, the program focused on emergency and temporary interventions like caulking and weatherstripping doors and windows. As the program expanded in the 1980s, it targeted more permanent structural features of homes – installing storm doors and windows, insulating attics, and so forth. Mid-1980s legislation approved funding for HVAC and water heating system interventions, eventually including replacing furnaces and boilers. As the less supportive context of the 1990s saw weatherization funding fall, program operators focused on trying to get more cost-effective results per dollar spent, including implementing advanced auditing techniques and diagnostic tools like blower doors. Changes in the 1990s also made air conditioning-related interventions more eligible for warm climate weatherization projects, including the replacement of air conditioning and ventilation equipment.

Weatherization assistance's dependence upon federal appropriations – and therefore upon a political system increasingly hostile to both alternative energy and welfare policies – meant that the program has had an uneven funding history over the last thirty years. Rising neoliberal interests made it a major target for government budget cuts. After the program saw increases in federal funds allocated through the 1980s (partially due to an influx of funds from litigation against oil companies), the 1990s ushered an era of cuts and chronic underfunding, particularly after 1996, as energy sector deregulation simultaneously picked up (Berry et al., 1997).²¹ Even at the 1988 peak of the programs' funding before the late 2000s, they only received \$500 million in total federal allocations. In the 2000s, annual funding had declined to an average of \$200-250 million (Tonn et al., 2011). Those budget allocations supported the weatherization of about 100,000 homes nationally per year. By 2008, the Bush-era DOE proposed to cut its weatherization funding completely. The Bush Administration had already proposed to slash LIHEAP funding by 22 percent. These cuts encompassed both its emergency aid money and its block grant funding to low-income households, 15 percent of which it was then allowed to dedicate to longer-term weatherization efforts (Bhambhani, 2008). Although these cuts provoked widespread criticism, the future of weatherization

assistance as a program and policy concept seemed highly tenuous. As we will see, however, this environment turned around in the late 2000s.

Inventing “Decoupling” and Demand-Side Management

Public programs also influentially reshaped how investor-owned utilities conceive of energy efficiency, and of their business model in a broader sense. US energy utility history, as with the country’s energy history and inherited energy economics more generally, has been structured by an ongoing search for new fuel supply. Hughes (1983), Nye (1992), Williams (1997), Hirsh (1999), and others explicate some of the historical context of this growth imperative, focusing particularly on the electric power industry. They describe how electric utility companies and the oligopolistic manufacturers of equipment for electricity generation (dominated by General Electric and Westinghouse) and home appliances pursued logics of ever-increasing energy generation and consumption for almost seventy years after the consolidation of the modern, interconnected US electrical system in the early twentieth century. During this period, research by electrical equipment manufacturers delivered steam turbine generators that converted fuel burned to electric power with increasing thermodynamic efficiency, and plants became ever larger.²² Hirsh (1999) explains the industry’s consequent “grow-and-build” strategy:

[Utilities] aggressively promoted the sale of electricity, especially to customers who could improve companies’ load factors, so utilities would have a reason to construct new power plants. Because manufacturers regularly developed technology that generated electricity more efficiently, utilities’ unit costs decreased when they installed the plants. Lower customer prices followed, which spurred demand, and the cycle repeated itself, leading to a self-reinforcing downward spiral in costs and prices (Hirsh, 1999, p. 46).

In the 1970s, many things changed. Increasing returns to scale along these established lines hit a technological plateau.²³ Industry hopes that nuclear power would be a top-down solution to these problems confronted increasing technical problems and social resistance, as influential direct action campaigns in states including California resisted the siting of plants (Hirsh, 1999; Walker, 2008). In addition, 1970s-era energy crises raised energy prices across the sector (partly due to utilities’ diversification from coal into oil as a generation fuel),²⁴ particularly because generators could not counter these fuel price rises with generation efficiency improvements as they had in the past. And the growing US environmental movements raised questions about many of the energy industry’s existing assumptions and practices, particularly its orientation toward ever-increasing growth and energy use.

In California and other sites of energy and environmental activism and experimentation, Lovins’ soft path proposal was encoded into broader law in important ways, as Hirsh (1999) has chronicled in depth. One wing of experimentation led to the 1978 passage of the Public Utility Regulatory Policies Act (PURPA), a federal law that opened up of the electricity supply to alternative generation technologies and nonutility wind and solar producers, as well as to natural gas turbine generation.²⁵ And critically, this context of experimentation also helped support the creation of a number of utility demand-side management (DSM) schemes.²⁶ In campaigns in California and several other states, legislators and regulators in state public utility commissions (PUCs) compelled utilities to offer consumers opportunities to reduce their electricity use via

conservation or structural efficiency changes, including weatherization.²⁷ In legislation “decoupling” energy sales and utility revenues like California’s Supply Adjustment Mechanism, introduced for natural gas utilities, and Electric Revenue Adjustment Mechanism, for electricity producers, PUCs gave energy utilities a way to not lose money from conservation. Under this strategy, PUCs accepted DSM interventions in utilities’ approved costs of doing business – the costs utilities are allowed to pass on to consumers in their rates, and which otherwise include building power plants and infrastructure. By reducing customers’ energy use and counting those costs as part of their state-approved outlays, utilities could avoid building new power plants.

That power companies could actually make money by providing less power, and that utilities (and ultimately nonutility companies) could provide broader “energy services” as well as more established material provision of current or fuel, were critical innovations (Hirsh, 1999, p. 201). Regulatory commissions and legislators, environmental and consumer advocates, and utilities further developed DSM and alternate resource planning innovations. These experiments through the 1980s included “least cost planning” and “integrated resource planning,” influenced by the work of Lovins and Roger Sant. By 1984, Lovins had begun employing the term “negawatts” to emphasize the parity of conservation and generation in providing energy services.²⁸

The idea that utilities could make money on intangible energy services provided important conceptual underpinnings for the economic dematerialization and deenergization visions put forward by advocates for ecological modernization in the broader economy (e.g., Mol and Spaargaren, 2000). And concepts like negawatts contain the seeds of other market environmentalist framings being advanced today with ideas like ecosystem services and the commodification of greenhouse gas emissions offsets, i.e. of selling a formal increment of pollution averted and intangible environmental benefit derived as an abstract physical “product.” (This idea also has precedent in finance’s evolution over the last thirty years, as investment banks and other players advanced the idea of intangible financial “products” like derivatives.)

Producing a Private Market in Energy Efficiency

The public programs surveyed in the last section pioneered new thinking on energy efficiency. More recent historical developments furthered the idea of energy efficiency as a resource, and notably how non-utility players might harness energy savings for profits. One influence was the 1990s wave of electric and natural gas utility deregulation, a trend that simultaneously threatened utility DSM programs and opened up unconventional energy markets. Another has been growing concern over anthropogenic climate change, and an increasing propensity to frame energy efficiency as a solution. Critically, the sector received a major influx of funds and renewed political attention in the late 2000s, from the Obama Administration’s massive expansion of weatherization funding after the 2008 financial crisis. The administration meant this funding as a subsidy to green economic development as much as a conservation or welfare program. Finally, the argument for energy efficiency is now being strengthened by rising attention to the embodied energy and emissions contained within existing built environments, the slow

addition and turnover rates of these landscapes in countries like the United States, and the energy and emissions costs of speeding up that rate of turnover.

Utility Deregulation and the Rise of ESCOs

Utility DSM schemes depended upon the sector's existing pervasive governmental regulation, the "natural monopoly" and PUC structuring that had organized investor-owned utilities in the twentieth century. However, as they developed through the 1980s and early 1990s, the regulatory frameworks and planning needed to implement DSM had increasingly stood out as an anomaly given the governmental rollback being advanced in other non-defense sectors, notably utility natural gas (Peck and Tickell, 2002; Harvey, 2005). The Energy Policy Act of 1992, passed after the 1991 Gulf War provoked anxieties about national energy security, helped usher in an era of free market rollout. These changes provoked considerable uncertainty around the future of DSM efforts. California's public utility commission influentially initiated restructuring efforts in 1993; state legislators formally deregulated the state's electricity system in 1996.

Hirsh (1999) and Duane (2002) chronicle how the rise of neoliberal deregulation compromised these structures and the innovative conservation and efficiency programs they had supported. Vine et al. (1999) the process and its problems:

Utility companies are also changing during the restructuring process. Several utilities (as regulated monopolies) have already unbundled their activities: e.g., generation, transmission and distribution, and retail services. Some utilities have sold off their generation assets and have focused on the distribution and/or retail side of the company. The implications of these changes for energy efficiency are unclear; however, some believe that the utility distribution company will be less interested in energy efficiency and load management than utility retail companies that actively market both energy and energy efficiency as value-added services.

Ultimately, these efforts culminated in the market gaming of Enron and the California electricity crisis of 2001. This story is well known. However, it has underexplored connections to developments today. One of the justifications for utility deregulation, as advanced by companies like Enron, was that this restructuring would open up opportunities for new kinds of energy efficiency services and businesses. Prominent in a wave of new energy businesses envisioned for a transformed market, ESCOs proposed to join or fully replace utilities as providers of a broad range of energy services, including efficiency retrofits. Dramatically expanding a model originally developed in the 1970s energy crisis, ESCOs conducted energy audits of large institutional and commercial buildings and campuses, commissioned building energy systems, replaced equipment, automated building energy management, and designed other tailored interventions into particular buildings' and enterprises' energy use.²⁹ Often they maintained an ongoing presence in order to oversee ongoing commissioning. Typically, ESCOs' revenue was tied to the energy that they saved clients through building commissioning, retrofits, project financing, and other services. Consequently, ESCOs took their fees out of energy costs averted, arrangements known as energy performance contracting (EPC). They also often included in-house or arranged third party financing packages to cover the upfront costs of retrofits. Enron's Energy Services was one high profile ESCO of the period.³⁰ The following survey demonstrates the broader variety of approaches experimented with in this sphere:

Equipment-affiliated firms use performance contracting as a sales channel for their products. Utility-affiliated firms offer ESCO projects as a value-added service to attract and retain large customers and generally focus only on their utility footprint. Non-utility energy services companies are product neutral, tend to have a larger geographic footprint, and typically offer a wide range of services from energy retrofits to renewable energy development.³¹

Revelations of Enron's market manipulations and fraudulent accounting soured the ESCO market for years, as utilities running ESCOs refocused on their core businesses and independent ESCOs failed or consolidated.³² However, more recent developments have reignited this field.

Energy Efficiency as a Climate Change Solution

Climate change framings have also been increasingly influential in driving renewed interest, and private market interest, in energy efficiency. They have helped shape energy efficiency visions that go beyond the large institutional or commercial clients of ESCOs into more mass-market spheres. Many voices argue that built environment energy use is highly greenhouse gas emissions-significant. EERE (2008) estimates that with buildings' growing electricity use, their relative share of rising US emissions rose from thirty-three percent in 1980 to forty percent in 2005.³³ The EERE calculates that these 2005 emissions put US buildings at nine percent of world carbon dioxide (CO₂) emissions, a greater share than all countries save the United States and China. The Intergovernmental Panel on Climate Change (IPCC) argues for the importance of intervening in built environment energy use as a climate change mitigation strategy:

The key conclusion of the chapter is that substantial reductions in CO₂ emissions from energy use in buildings can be achieved over the coming years using mature technologies for energy efficiency that already exist widely and that have been successfully used (high agreement, much evidence). A significant portion of these savings can be achieved in ways that reduce life-cycle costs, thus providing reductions in CO₂ emissions that have a net benefit rather than cost... Our survey of the literature (80 studies) indicates that there is a global potential to reduce approximately 29% of the projected baseline emissions by 2020 cost-effectively in the residential and commercial sectors, the highest among all sectors studied in this report (high agreement, much evidence)" (IPCC, 2007, p. 389).

These framings emphasize the energy and environmental significance of the US built landscape. They consider both its initial construction and its operation, the way that buildings and urban geography structure everyday life and economic reproduction. They argue that these patterns make fossil energy use and other environmentally significant consumption habitual, inconspicuous, and hard to change.³⁴ Climate change mitigation programs and green enterprises that target amendments to these built environments, and behaviors within them, mark a departure. Climate change mitigation discussions had been dominated by technologies that could be plugged into existing centralized power grids, loopholes, and workarounds. In the best case, proposed solutions included utility-scale renewable energy deployment. However, they also often encompassed carbon offsets (see the previous chapter for some critiques of these schemes), nuclear power, natural gas (as a "transition fuel," an argument made because of natural gas's lower emissions density relative to coal), "clean coal" (i.e., including carbon sequestration), and highly dubious geoengineering proposals. Critics of these "magic bullet" proposals have long called for

the deeper transformation in industrial economies and landscapes that energy conservation represents.

End-source energy replacements, offsets, and geoengineering schemes attempt to avoid industrial country “pain” in emissions mitigation.³⁵ Critics focus on how much more difficult to achieve, and more invasive, if actually implemented, attempts to control emissions in these spaces of everyday life might be. And undoubtedly, existing US landscapes are often particularly energy and emissions-intensive. They are even more so after the boom in sprawling exurban residential, commercial, and industrial development of the 2000s – considering, for example, the country’s new subdivisions of large, centrally heated, air conditioned, and appliance-heavy single family homes, located in sprawling metropolises unfriendly to mass transit, walking, or biking (Gonzalez, 2005; Huber, 2009; Knuth, 2010).

However, as discussed previously, concomitant with arguments about the US’s built environment as an emissions problem have been framings of it as an economic chance for the ambitious. In this context, boosters of a green economy (e.g., McKinsey & Co., as discussed in the last chapter) are reframing deep interventions in the built environment and everyday life as revolutionary opportunities rather than as intractable challenges.

Green Collar Jobs: Weatherization Reborn

A critical support for the expansion of energy efficiency in the late 2000s was new funding and support for utility and federal government weatherization programs. The federal government reframed weatherization as a force for jobs creation and economic growth as much as for low-income aid and energy conservation. The new wave saw increasing interest in private sector energy retrofits and services beyond the large clients traditionally served by ESCOs: the rise of a mass market for energy efficiency among homeowners and small businesses.³⁶

In the aftermath of the 2008 financial collapse and ensuing deep recession, green collar jobs advocates quickly focused on the construction jobs that energy efficiency retrofits could provide. According to Chapple and Hutson’s (2010) overview of green collar jobs advocacy, energy efficiency became a major framing point for the overall discourse.³⁷ Proponents argued that energy retrofits’ labor intensity and demand for skilled contracting knowledge could create good, durable working class jobs. And advocates emphasized that besides providing steady work, the socially critical nature of these jobs on the forefront of climate change mitigation and resilience and the frontier nature of some of the technologies involved posed important potential to recapture the sense of dignity involved with manual labor in the US. New weatherization advocacy reinvoked and generalized ideological groundwork laid in the 1970s, i.e., pointing out that, while providing working class jobs, energy efficiency retrofit programs could simultaneously save strapped homeowners money on energy bills and help add to home value – theoretically helping housing left “underwater” post-crisis.³⁸ Given the time per building required for substantial retrofits, expanded public or private weatherization efforts also seemed to promise durable local jobs in places with deteriorated building stock – often places in which this kind of influx of investment would be significant (see energy efficiency jobs creation models developed by e.g., Roland-Holst, 2008; Goldman et al., 2010; ACEEE, 2011; and see Wei et al., 2010 for an analytical survey).³⁹

As the new advocacy envisioned generalization of energy retrofitting beyond weatherization programs' original concentration on (although never a completely exclusive focus on) low-income homeowners, it proposed more ambitious jobs creation visions. The generalization of a new concept of "modern" building standards, and thus sub-standard, obsolescent, and potentially "blighted" property, carries its own risks for working class people and places. Green collar jobs creation models that focused on energy efficiency expanded the kind of argument that low-income weatherization proponents had long made for these programs' economic and community benefits; they argued that the expansion of local energy efficiency retrofitting business could also be a critical source of green collar employment. Working class jobs cited include professional energy auditing, building inspection and certification, and equipment installers, in addition to more traditional construction work.

Responding to these kinds of visions, the Obama Administration dramatically stepped in to alter the calculus of low-income weatherization programs. The 2009 American Recovery and Reinvestment Act (ARRA) massively expanded federal weatherization assistance via a one-time \$5 billion dollar grant, an increase in scale that in one year nearly equaled the program's cumulative funding over its entire thirty-plus year history and that would change its very nature (EERE, 2009; Tonn et al., 2011). The rejuvenated version of the program would be much more about durable jobs creation – and good jobs, as for the first time the wages for weatherization workers were required to conform to the federal government's Davis-Bacon Act prevailing wage requirements. (This 1931 act requires federal construction jobs to pay prevailing wages to contracted workers, a stipulation meant to protect union-scale pay.) Other moves toward making the program more durable include funding for more substantial retrofits, an expansion in the kinds of households served (i.e., the household income threshold was eased), and the creation of programs to promote innovation in energy retrofit practice:

A greatly expanded weatherization workforce has been recruited, trained, organized, and sent into the field. In order to support this expansion, the percentage of spending allowed for training and technical assistance has been raised from 10 percent to 20 percent...[and] substantial amounts of funding have been set aside to support innovations in Program funding and design. The first of these, for the Sustainable Energy Resources for Consumers (SERC) grants, sets aside up to 2% of funds to encourage innovative projects by Weatherization subgrantees (i.e., local weatherization agencies) to further weatherization efforts that are outside the scope of existing Program regulations and restrictions. The second, the Weatherization Innovation Pilot Program (WIPP), sets aside \$30 million to encourage the formation of partnerships with both traditional and non-traditional weatherization providers so that non-federal resources can be leveraged to pursue the Program's purposes...the average cost ceiling (the average amount of money that can be spent by grantees to weatherize homes) was increased from \$2,500 to \$6,500 (Tonn et al., 2011, pp. 1-2).

Weatherization programs presented many advantages to the Obama Administration as it sought unemployment relief and economic stimulus opportunities that could be quickly rolled out nationwide and produce jobs right away. Tight cost-benefit rationalization pressures under which the administration operated only heightened the pressure to produce quick and cost-effective results.⁴⁰ These demands proved challenging for many kinds of green economic industry that were in early development stages and posed only uncertain job creation prospects. By contrast, the administration

could argue that weatherization programs were a fully worked out economic and environmental proposition whose potential had only been held back by their heretofore chronic underfunding. Subsequent programs like Recovery Via Retrofit took up a similar line on the economic potential of retrofits. The Obama Administration consistently framed construction employment retrofitting infrastructure and the built environment as a non-outsourcable job, announcing goals like “[putting] construction workers back to work with good jobs that can’t be outsourced building the tools and transportation network our businesses need to compete globally” (White House, 2013, and see e.g. Moe, 2009⁴¹ for an example of how this language has been taken up more broadly). This argument of course has its attractions given existing US manufacturing job loss – to domestic mechanization as well as the outsourcing and transnationalization of production. As later chapters will discuss, it also speaks to the travails of Solyndra and other US clean energy manufacturers who faced the harsh winds of zero-sum global competition and overproduction.

States scrambled to get a share of this federal largesse. Notably, Southern and Sunbelt states benefited from 1990s-era lobbying that under certain conditions changed the weatherization funding allocation formula to grant them more resources. Although weatherization has typically focused on winter heating and has more proven success in achieving savings in this area, Southern states complained about air conditioning needs being under-recognized. Although this change had been on the books for twenty years, only twice in the past had weatherization funding surpassed the annual dollar value trigger that would induce this Sunbelt-shifted allocation switch – ARRA meant in this case a windfall (Cooper, 2009).⁴²

However, as with many ARRA policies, programmatic problems and reactionary partisan backlash quickly combined to sour the public discourse. Critics complained about the unexpectedly slow pace of weatherization rollout during the initial phase of the expanded program’s operation (see discussion by Defendorf, 2010). Responding to these attacks, governmental analyses of the program (DOE 2010a, 2010b; GAO, 2010; Tonn et al., 2011) identified common ARRA problems like the states’ distressed fiscal condition in the crisis: facing hiring freezes and cuts in personnel, many had few resources to dedicate to the new bureaucratic demands attached to ARRA funding. The ARRA expansion eventually scaled up successfully and surpassed its initial goal: after three and a half years of activity, in 2012 it weatherized its one-millionth home; administrators calculated that it produced 12,000 direct jobs per quarter during this time (EERE, 2012).

Embodied Emissions and Life Cycle Analyses

New building science is aiding calls for building retrofits and energy efficiency. For example, researchers are exploring the sometimes quite high efficiency of older buildings, ones constructed before an age of cheap energy. Often these structures use more traditional passive heating and cooling features (e.g., Chong, 2012). Depending on the class of buildings, they may also have been constructed more durably than the current standard, delivering slower energy-significant structural deterioration. Moreover, advocates of energy retrofits have been aided by a wave of research on the full life cycle energy and environmental impacts of building construction.

As more analysts consider the full energy and emissions footprints of existing built environments, they argue that a focus on new construction ignores much of

buildings' actual environmental significance. Unless existing buildings are being remodeled, they do not drive new demand for building materials like forest products. In the United States, the vast majority of buildings today are the relics of past deforestation waves and petrochemical booms rather than ongoing forces in these forms of resource extraction. However, buildings – more properly, household and economic reproduction in these buildings – do demand energy on an ongoing basis: modern American landscapes cannot be operated without ongoing energy consumption for heating and cooling, lighting, and for transportation between these dispersed interior spaces. Thus, barring major fossil fuel replacement in the energy system, they will continue to contribute to climate change throughout their operational lifetimes. Life cycle analyses (LCAs) consider these ongoing costs. They also extend their analyses to the energy, material, and emissions costs of maintaining landscapes once constructed, and of potentially demolishing and/or rebuilding them. Increasingly, commenters also examine important twenty-first influences on these patterns. They forecast secular twenty-first century changes in energy costs, consider the needs of urban resilience and climate change adaptation, and envision new kinds of *economic* depreciation in buildings, as technological and social changes stand to make buildings obsolescent and devalued in advance of their gradual physical deterioration and consequent value depreciation. This growing scholarship includes Lemer (1996), Junnila and Horvath (2003), Horvath (2004), and Junnila et al. (2004); see IPCC (2007) for a review of the literature up to that point.

Questions of the rate of turnover of existing built environments, and the energy and emissions required to accelerate that rate via demolitions – even to construct green, high energy performance structures – are also becoming more influential in calls for energy efficiency retrofits. The IPCC (2007) presents a strong statement from its state of the science survey:

Over the whole building stock the largest portion of carbon savings by 2030 is in retrofitting existing buildings and replacing energy- using equipment due to the slow turnover of the stock (high agreement, much evidence). There is a large stock of existing and inefficient buildings, most of which will still be here in 2025 and even 2050. Our long-term ability to reduce energy use depends critically on the extent to which energy use in these buildings can be reduced when they are renovated. The equipment inside a building, such as the furnace or boiler, water heater, appliances, air conditioner (where present) and lighting is completely replaced over time periods ranging from every few years to every 20–30 years. The building shell – walls, roof, windows and doors – lasts much longer (IPCC, 2007, pp. 389-404).

As the quotation illustrates, research like IPCC (2007) and EERE (2008) shows that only a small percent of the US's existing buildings now turn over every year, i.e. are demolished and potentially rebuilt. Thus, even if all new buildings constructed were successfully made “carbon neutral” in their operations, it would not dramatically change the built environment or its energy use. In other words, initiatives must in practice contend with the massive built environment that has already been produced.⁴³ The Pacific Northwest National Lab estimates that the median building lifetime in the United States is 75 years. (Of course, with variation on a per-building level.)⁴⁴ The Urban Land Institute (2010) estimates that commercial real estate is only replaced at the rate of 2 percent per year – and far slower in recessions.⁴⁵ Efficient energy performance and carbon neutral buildings would diffuse only slowly through the existing built environment at this rate.

But speeding up this overall turnover time, e.g., via large-scale demolitions akin to those of the US's midcentury urban renewal (Boardman, 2007), poses its own energy and environment costs. LCA's full cost approaches to energy and environmental analysis make it increasingly difficult to ignore the footprint of demolition of existing landscapes, even if they are rebuilt in the form of high performance structures. LCAs suggest that the energy and environmental costs of demolition and new building materials acquisition threaten to outweigh the operational energy savings potentially achieved, even if new buildings can be more thoroughly redesigned for carbon neutrality than existing structures. They therefore propose retrofits of existing buildings and behavioral modification approaches (i.e., finding more energy efficient ways to inhabit existing built environments) as alternatives.

The current flood of interest has not been lost on the architectural preservation community, the group with most established interests in the long-term conservation and reuse of existing buildings and landscapes. In March 2009, the National Trust for Historic Preservation created the Preservation Green Lab, a new programmatic office meant to form a central part of its sustainability activities going forward. This initiative's activities have constituted a major front for targeted research and activism about the importance of retrofitting the existing built environment for energy and emissions savings. The lab's research is unusually sensitive to how *geography* matters in these questions. They examine how differences in physical and cultural conditions shape difference in energy use. For example, they consider how regional climatic differences shape different energy needs for building heating and cooling (something existing building science does also account for at the macro-scale, as discussed above). More unusually, they examine how divergent histories of landscape production and built environments inherited today influence energy consumption. For example, they ask when buildings were constructed (i.e., how long they have had to deteriorate with and without major renovation), with what existing technologies (e.g., if they respond to local climates by implementing passive features or are air-conditioned boxes, how they are wired, what suites of appliances they contain), and with what histories of intervention and landscape change since original construction. These questions are critical in characterizing the actual complexity of built environments and urban building stock today. However, getting at them has required the unique knowledge that preservationists bring to the table, which goes beyond qualifications in engineering and building science into expertise in regional history and geography, cultural landscapes, and vernacular architecture.

The National Trust is now developing programmatic strategies and policy tools around energy and environmental redevelopment. The Preservation Green Lab has engaged in the popular discourse around these issues (Moe, 2009; Cochrane, 2011); with the New Buildings Institute, it organized a national summit in 2011, "Deep Savings in Existing Buildings." In addition, the Preservation Green Lab and the New Buildings Institute are partnering with the City of Seattle to develop a new "outcome-based" energy code meant to serve as a national model. This code encourages building owners to experiment with innovative new construction retrofit techniques and stipulates ongoing post-construction or renovation monitoring to make sure that these strategies are paying off in terms of energy saved. The Earth Advantage Institute (2011) notes this practice as one of its top green building trends, going into greater depth on these codes' significance:

Existing buildings are responsible for most energy use and associated carbon emissions, but the prescriptive energy codes used in commercial remodels don't encourage effective

retrofitting. Compliance with energy codes is determined at permit time, using prescriptive or predictive models, and actual post-construction may never even be reviewed. Heating and cooling equipment could be faulty or improperly controlled, with significant energy and financial implications. Under outcome-based energy codes, owners could pursue the retrofit strategy that they decide is most effective for their building and its tenants, but they would be required to achieve a pre-negotiated performance target through mandatory annual reporting.

However, technical questions remain in these endeavors to promote energy efficiency retrofits, notably regarding buildings' share of embodied versus operating energy in use. "Embodied energy" is the energy required to produce a building, including everything from materials extraction and transport to the construction process itself. "Operating energy" includes the energy required to heat and cool the building's interior space and supply its occupants with electrical services over the operating lifetime of the building. The relative weight of each of these processes is debated. For example, see UNEP SBCI (2009) for prevailing smaller estimates of the share of embodied as opposed to operational energy in buildings.

The full extent of the life-time emissions of a building can best be understood by using the life-cycle (LCA) approach. The LCA approach reveals that over 80 percent of greenhouse gas emissions take place during the operational phase of buildings, when energy is used for heating, cooling, ventilation, lighting, appliances, and other applications. A smaller percentage, normally 10 to 20 percent, of the energy consumed is for materials manufacturing and transportation, construction, maintenance renovation and demolition (p. 6).⁴⁶

See also IPCC (2007):

For typical standards of building construction, the embodied energy is equivalent to only a few years of operating energy, although there are cases in which the embodied energy can be much higher (Lippke et al., 2004). Thus, over a 50-year time span, reducing the operating energy is normally more important than reducing the embodied energy. However, for traditional buildings in developing countries, the embodied energy can be large compared to the operating energy, as the latter is quite low (IPCC, 2007, p. 405).

With a wave of more extensive LCA and the rise of new ideas in high efficiency building design and renovation, considerable debate has arisen about the kinds of totals presented in these quotations. In determining these relative operating versus embodied energy shares and their range of variation, of course much depends on *how* retrofits and renovations are carried out: how locally materials are sourced, how low versus high tech they are, how much human versus mechanical labor is used, to what standard of energy use buildings are being renovated, and so forth. As operating energy decreases with proposed energy efficiency improvements, embodied energy becomes relatively more significant – for zero net energy buildings, the only energy use and GHG emissions produced. Although the calculation of full embodied energy and emissions of existing landscapes is in part an intellectual exercise, it becomes far more than that when landscape replacement – particularly the kinds of major demolition-and-rebuild visions proposed now – become actual objects of political consideration and debate, as Boardman and other analysts have found in the work in the UK. In the US context of campaigns for clean technology and the green economy, politically relevant consideration

of embodied costs might mean looking at the full life cycle costs of producing advanced building materials like high performance and phase-change windows (e.g., see IPCC, 2007): potentially large upfront impacts generated in their production must be justified by even larger long-term savings in their operation.

The Preservation Green Lab is beginning to take up this under-researched question in more detail. It argues that its most recent research on these questions, summarized in its 2012 report *The Greenest Building: Quantifying the Environmental Value of Building Reuse* constitutes the most comprehensive analysis conducted to date on these questions. According to its new calculations, it would actually take most new buildings in different US climates between 20 and 30 years to compensate for the initial carbon impacts of their construction; new energy efficient buildings may take anywhere from 10 to 80 years to overcome these climate change impacts through subsequent efficient operations. In addition to these higher numbers overall, its findings demonstrate considerable variation in the United States between type of building and city. It argues:

Building owners, developers, policy makers, and green-building experts often assume that it is preferable to build a new, energy-efficient building than to retrofit an older building to the same level of efficiency. Yet...national data on building energy performance indicates that some existing buildings, particularly those from the early 20th-century, perform as well as, or better than, modern-day buildings. For example, data from the U.S. Energy Information Administration (EIA) demonstrates that commercial buildings constructed before 1920 use less energy, per square foot, than buildings from any other decade of construction...the comparative advantage of some older buildings may in fact be explained by the original building design, form, massing, and materials, as well as the window-to-wall ratio, limited installed equipment, or occupant density (Preservation Green Lab, 2012, p. 18).

The report's methodology provides a deeper illustration of what more geographically sensitive built environment analysis might consider, from climate to the local political structuring of construction (for example, building codes and zoning requirements), demographic shifts, and changes in fashion. Particularly important US trends have included, for example, the increasing size of houses, a highly significant trend for their heating and cooling loads. And it emphasizes historical process – and critically, historically produced complexity and variation within existing landscapes. Questions include what exists now both in terms of structure and amount of existing deterioration, previous interventions in these physical depreciation processes, and the vintage of these interventions – i.e., what “modernization” meant in different eras of remodeling. And it considers how much building occupants matter in total energy use, particularly for operating energy, both in the range of variation of everyday behaviors and in more structural choices like building maintenance (or more active building management in commercial buildings, e.g., via contracts with ESCOs).

Overall, this building science and historical and geographical research bolsters the case for energy efficiency retrofits in meeting energy and environmental goals (Boardman, 2007; Olgyay and Seruto, 2010). They have helped move this discussion mainstream. Increasingly, market analyses from real estate industry mouthpieces take up a similar line. See, for example, the Urban Land Institute (2010):

The Action Is in Existing Buildings: Even at the peak of recent building cycles, only 2 percent of the total existing floor space annually is added by new commercial building construction. In the years ahead, this portion is likely to remain below 1 percent. New building construction is delivered at the performance standards of applicable building and energy

codes, in contrast to older buildings. It is the balance of buildings—the overwhelming majority of the existing building stock—that remains the dominant untapped market opportunity to invest in energy efficiency (p. 7).

A New Boom in Energy Efficiency

The evolving arguments and strategies reviewed above combined in the late 2000s to produce a major renaissance in energy efficiency activity and investment. This conjuncture witnessed a boom in energy retrofitting, energy efficient design, and the expansion of energy services outside of the traditional structure of investor-owned utilities. It saw a wave of retrofits of large institutional and commercial buildings. It has also observed unprecedented interest in mass market energy retrofits. New start-ups targeting energy in buildings included a proliferation of energy retrofit companies that extended beyond ESCOs' traditional focus on large buildings and specialized interventions: the new businesses sought new solutions for smaller buildings including homes, and more standardized retrofits. Beyond this significant expansion in companies providing specialized energy services and building retrofits, new and expanded enterprises also included niche architecture and design firms, building materials and equipment suppliers, and cleantech start-ups envisioning everything from new ways to influence energy behavior to hyper-advanced building materials to new kinds of automated home design. Start-ups and larger companies dedicated to manufacturing building materials, appliances, and building systems sought to develop products for more ambitious retrofits and building designs. Meanwhile, other cleantech ventures proposed new “big data” analysis tools and behavioral modifications strategies for reducing energy use in interior spaces, often partnering with utility companies to develop pilot programs. And still other start-ups and larger financial industry partners proposed new financial “products” that would use retrofits' long-term energy savings to finance the upfront costs of these changes.

Energy Efficiency as a Resource

In commercial real estate, ESCOs have again become big business. They expanded from an earlier focus on public institutions to enter private commercial real estate in a major way (IPCC, 2007 versus Urban Land Institute, 2010). Pike Research (2011) projects that ESCOs will more than double their global revenue between 2011 and 2016 (from \$30.1 billion to \$66 billion); it projects these companies to make up the largest segment in the new sector of energy efficient commercial real estate. However, tensions as ESCOs enter the commercial sector include questions about whether private clients might instead choose to perform their own retrofits, if they can be assured of a high rate of return on their investments (Urban Land Institute, 2010). Major global ESCOs include Honeywell's Building Solutions, Johnson Controls, Schneider Electric, Serious Energy Inc., Siemens Building Technologies, and Chevron's Energy Solutions ESCO, among many more (Pike, 2012b). Notably, as the next chapter will discuss further, some of these massive companies are now teaming up with digital green players to pioneer advanced controls, building automation, smart metering and big data, and other schemes. For example, Honeywell recently teamed up with Opower, one of the leading software

companies in this sector, to sell a Web-connected programmable thermostat that collects data and performs automated building response functions.

Energy retrofits joined a broader field of energy efficient design. Although still a small market, there has also been increasing movement on the redesign of buildings from the ground up for high energy performance – performing significantly in advance of international energy standards for buildings and going well beyond the operational energy savings able to be achieved by weatherization or even more substantial remodeling efforts. Advance concepts include, for example, Zero Net Energy buildings and homes certified according to the German PassivHaus Institut’s certification scheme; superinsulated and with other advances in their building seals, “passive houses” are designed to be furnace-less and ductless. Other professional bodies who have become critical in this field globally include the Building Performance Institute, a major player in advancing home energy auditing techniques; non-profit institutions and research organizations like the Global Green Building Council (GBC); and energy efficiency standards-setting and real estate appraisal bodies including the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), the International Organization for Standardization (ISO), the Appraisal Institute, Royal Institute for Chartered Surveyors (RICS), and the Vancouver Valuation Accord.

Surveying the market for energy efficient buildings and retrofits, market analysts report dramatic late 2000s shifts and project rapid worldwide growth over the next decade. Analyzing the large segment of the energy efficient buildings market that encompasses the activities of ESCOs, high-performance building physical plant equipment for things like HVAC systems, and energy-saving lighting, Pike Research (2011) reported large existing markets in North American and Western Europe and a fast-growing Chinese energy efficiency sector (particularly given the Chinese government’s strong energy efficiency mandates and the country’s rapid construction of commercial building space – according to their calculations, approximately 7 billion square feet added per year). Pike (2012b) updates Pike (2011) numbers on new and retrofitted commercial buildings to suggest that the global retrofit market alone for commercial and public buildings will expand from \$80.3 billion in 2011 to \$151.8 billion by 2020. Considering both new construction and energy retrofits, Pike Research (2012a) projects an additional global residential market of \$84 billion by 2020 (including in this total homes that exceed the 2009 International Energy Conservation Code by 15 percent on a kilowatt-hour per square foot basis). This dollar value projection encompasses key market segments including building envelope improvements, lighting, HVAC and major appliances, water heating, energy audits, and “soft costs” associated with energy efficiency.

The critical innovation of these proposals for making energy efficiency retrofits and conservation drive green economic growth is to turn the US’s high energy footprint on its head and frame it as an resource rather than as a problem. One aid to market environmentalism in this sector is that although energy efficiency as a resource itself is a new proposition, it operates within existing markets for energy. Energy efficiency as a resource proposals thus take advantage of the work that utility companies and regulators did at the turn of the century and afterward to rationalize energy and power as commodities and to create markets for these products (Hughes, 1983; Nye, 1992, Hirsh, 1999). Of course, this process was also facilitated by the malleable materiality of fossil

fuels and the processes of electromagnetism, although Hirsh's (1999) account of the thermodynamic limitations of steam turbines and other electric generation technologies suggest some of the stubborn material constraints at work and the real labor of environmental simplification required in other aspects of the system's creation.

On the ground, advocates' energy efficiency as a resource argument is that property owners can expect retrofits reduce their energy consumption, and consequently their energy utility bills, long enough to pay back upfront investments, and for some period, often hazily defined, beyond. Owners can similarly expect investments in improved building energy efficiency to pay themselves back over time. Again assuming that the structure and its retrofits physically deteriorates at a relatively slow rate, these improvements can be converted into a steady stream of energy savings that continues to contribute to property value well after the initial investment in them is paid off. For investors, the value of this predictable stream of revenue over time may be discounted and compared with the value stream of competing investments. This calculation resembles the way that real estate investors have typically since World War II expected to benefit from their holdings of long-duration US residential mortgages. What is more, investment analysts expect building energy investments to have far more speculative value to property owners than these modest returns might indicate. Just as generally rising real estate market values through much of the 2000s increased the appraised value of individual properties, analysts hypothesize that future general market movements will increase the size of the premium for high energy performance properties. Chapter 5 examines this proposal in greater depth.

Financing an Energy Efficiency Boom

A critical problem that energy efficiency advocates must deal with is how consumers – building owners and operators, including households – will pay for more comprehensive energy retrofits and remodelings. This issue, and potential opportunity, has become increasingly important as more players have become interested in mass-market opportunities for energy efficiency retrofits, beyond the kind of boutique financing arrangements that ESCOs have set up with large clients. Paying for these changes upfront is a big ticket item for homeowners and small businesses. Although proponents argue that consumer money spent on weatherization will pay itself back to them in the form of reduced energy bills over time, more substantial retrofits can mean large upfront costs and consequently long payback times – enough to deter potential clients. Increasingly, market players have framed this problem as a “financing gap,” creating rhetorically a need for financial players to fill. For example, Urban Land Institute (2010) presents this kind of financing gap argument: “There's a disconnect in the market between the huge amount of capital available to develop great new innovations in technology and the finance tools available to deploy them in real estate.”

In response to this problem, Renewable Funding, Ygrene, and a number of other dedicated financial start-ups have started to develop instruments and financing arrangements. In the most general sense, they work, like solar sector companies, by having a third party take on that debt for the retrofits and pay off contractors; SolarCity's success has been a noted model for energy efficiency ventures. Building owners then pay the third party company back in installments with interests, money meant to come out of the energy efficiency saved. Some of these financial ventures cover financing associated

with both energy retrofits and solar panel installation. Meanwhile, ESCOs continue to include both service and finance through EPCs, and increasingly through a wider array of experimental financial engineering.

One new financing instrument that has been developed for this sector is Property Assessed Clean Energy (PACE), a financing vehicle developed during the formation of Berkeley, California's local climate change mitigation plan (see Fuller et al., 2009). (As Chapter 8 will discuss more, local governments in the San Francisco Bay Area and elsewhere have helped pioneer the development of these third party financing models and start-ups.)⁴⁷ This instrument works as an assessment on a property – in other words, a lien on a mortgage. Notably, it solves one problem that has afflicted both solar panels and energy retrofits, that building owners may move before their energy investments are fully paid back. Since rather than following borrowers, PACE loans stick with the improved properties themselves as a lien, new homeowners – or now businesses, as much PACE lending activity has shifted to the commercial sector – take on payments when they buy the property.

When the instrument was created in the late 2000s, local governments were the key intermediary for offering these products to homeowners. See, for example, the Urban Land Institute (2010)'s summary: “[PACE] allows private property owners to accept a voluntary priority tax lien on their property, which becomes the basis for a municipality to aggregate liens to issue bonds and provide capital to the lienholder to make energy efficiency or clean energy improvements to the property.” Looking at how PACE and other models work, scholars must also move up from the scale of individual properties to consider the financial architecture that they propose. These structures centrally include pooling of liens from individual properties and onselling to secondary markets. This securitization of debt that has been proposed as a go-to financial innovation for many purposes today; it was also an important factor in the production of the subprime bubble. This model has faced major challenges in today's ongoing real estate and economic difficulties, moves that have prompted consideration of new strategies like private PACE funding and commercial PACE.

Besides PACE loans, other important new financing ideas in the sector include schemes like utility on-bill financing. On-bill schemes propose utilities as partners for third party financiers, looking to the same pool of utility client data as new big data applications (the next chapter further discussions these information technology interventions). Besides the energy use information that utilities hold, they also maintain records of payments made and other possible proxies for customer creditworthiness.⁴⁸ Financing ventures also similarly eye the advantages for instrument marketing and fee collection that utilities' existing delivery systems provide. On this speculative side, another more abstract market vision that invokes energy efficiency as a resource is energy efficiency credit trading. “White credit” schemes seek to abstract and trade this value, much like greenhouse gas emissions trading schemes. For example, see Oikonomou and Mundaca (2008), Vine and Hamrin (2008), Friedman et al. (2009). Pacific Carbon Exchange (2010) even proposes direct building level carbon trading. Critical analysis of the idea of energy efficiency as a resource must consider whether the surplus derived from energy efficiency retrofits or behavioral interventions is likely to be either large or reliable enough to support such a dense field of financial engineering.

As discussed in the last chapter in terms of the idea of a “yield gap,” the framing of a “financing gap” is important, both terminologically and for its diagnosis of the lack of energy efficiency uptake so far. This explanation sidesteps other explanations that scholars might proffer from the history surveyed here, such as cheap energy prices or habitual or locked-in consumption behaviors. The notion of a financing gap is helping to shape energy efficiency retrofitting as a “natural” sphere for financial intervention and creating an argument for the urgency of new investment and the formation of public-private partnerships. In the Great Recession, these green financial visions have been an arena for attempted reconstruction of the patina of neutral expertise long cultivated by finance, a reputation that collapsed in the subprime crisis and its aftermath of speculation, failure, and fraud. These logics are now coming up critically in “bringing to scale” concerns, i.e., discussions of how to leverage state investment to produce major private markets (ACEEE, 2012).

Because the actual value of energy efficiency as a resource here depends upon the price of energy saved, things that affect the price of energy can make energy efficiency a more or less valuable resource. Many factors go into this determination. For example, if we are dealing with the electric power sector, we have to consider the relative prices and role in the generation pool of coal, natural gas, renewables, and other sources, both now and in the future. This can make for a complex set of calculations. In the decades to come, interventions including carbon regulation and pricing potentially have the power to more synoptically rework energy prices. In contrast, today’s turmoil in climate policy, by helping keep fossil energy cheap, devalues energy efficiency – a major blow to would-be capitalists in a green economy. As late chapters will explore further, this problem is a key way in which the lack of climate policy can impair energy efficiency schemes – even if efficiency is positioned as a way of reducing emissions without the need for formal policy or head-to-head confrontation with the fossil fuel industry, as the Obama Administration often seemed to do in the late 2000s.

Toward a Conclusion: Contradictions and Breakdowns

Does Efficiency Save Energy?

The basis for energy efficiency as a resource is the ability to demonstrate quantifiable, predictable energy savings, typically expressed in kilowatt-hours (kWh) or British Thermal Units (BTUs). This is the quantitative stream of value that is meant to ultimately ground the enterprises and financial architectures surveyed above. These schemes’ promises that interventions will actually produce a stream of energy savings over time are likely to be rapidly put to the test. The programs discussed here must work, and work quickly, or the incipient environmental market that they have proposed will collapse in its infancy. Given this imperative, we must acknowledge the challenges that DSM programs have long faced in this regard. Coming up with rigorously quantifiable results has long been a priority for utilities for building retrofits performed under the aegis of DSM programs. However, it has not been an easy objective to fulfill (Hirsh, 1999).

Measurement and verification has been a long-term challenge in DSM programs: replacing tangible energy delivered with less tangible energy saved is not as simple a task as more optimistic booster arguments might suggest (Chong, 2012). For example, many

players worry about the durability of energy savings produced in these programs: the problems that arise if money is invested in things like energy retrofit but fails to pay off for the utility in the form of electricity or energy saved, or to pay itself off on a timescale deemed acceptable. Critics raise additional difficulties in the construction of baselines of existing energy use pre-intervention. In this respect, operational energy and emissions-saving buildings demonstrate similarities with, for example, a carbon-sequestering forest. The stream of savings from the building are tallied as a deviation from a baseline modeled into the future, much as emissions would be. In market frameworks, these construct a fiction necessary for the purposes of evaluating results. However, in both cases the exercise is necessarily speculative, counterfactual, and perhaps fatally flawed (Lohmann, 2005; ACEEE, 2012).⁴⁹

An important initial weakness in the energy efficiency framing of many of the visions surveyed here is that they often de-emphasize energy *conservation*. For example, building redesign and retrofits will not necessarily produce the social engineering that they desire: building occupants may prove unamenable to designers' and engineers' attempts to control their energy use behavior. Many critics have argued that the human behavioral element in everyday energy consumption has consistently been underestimated in more technocratic, engineering-focused visions (e.g., Lutzenhiser, 1993; Wilhite et al., 2000; Sanne, 2002; Wilk, 2002; Shove, 2003; IPCC, 2007; Harris et al., 2008; Bailey and Wilson, 2009). In addition, some critics have invoked Jevons' Paradox (Alcott, 2005) to critique energy efficiency interventions, arguing that by reducing energy costs, these efficiency improvements enable households or other energy users to consume more, the "rebound effect." Other commentators counter that built environment interventions will actually produce more durable energy conservation and emissions mitigation, that Jevons' Paradox represents a poor understanding of the complex non-price factors that drive household and workplace energy behavior (see e.g., Greening et al., 2000 for a discussion of these debates).

Although building scientists and engineers are developing high tech materials and design strategies that may revolutionize building construction and commissioning (APS Physics, 2008), the human behavioral element in everyday energy consumption has consistently been underestimated in these technocratic visions (e.g., Bailey and Wilson, 2009; Lutzenhiser, 1993; Shove, 2003; Wilhite et al., 2000; Wilk, 2002). These studies, and many more like them produced by participants in American Council for an Energy-Efficient Economy (ACEEE) summer studies, researchers from Lawrence Berkeley National Lab and other sources, emphasize that real social and cultural variation exists in building energy use practices. People do not always respond to energy efficiency improvements in expected ways, particularly if they do not fit the nuclear family, middle-class, single-family home model often used as a default assumption in technical analyses. More efficient dwellings do not necessarily equal lower overall energy consumption, particularly if efficiency measures lower energy costs for building inhabitants for whom utility bills had been a significant burden (Alcott, 2005).

An even bigger problem raises its head when efficiency and total energy use diverge. Energy efficiency framing can lead to "victories" in decreasing energy and emissions intensity relative to some metric like economic growth without translate into actual energy saved or emissions reduced. This critique of efficiency can be scaled up to the level of state and national energy and climate programs, since even successful long-

term energy efficiency programs like California's have succeeded in reducing energy intensity rather than net energy consumption. (The strength of the link between California's thirty-year building energy efficiency policies and energy use trends achieved has also been questioned by authors who emphasize the importance of climatological, economic, and cultural complexities in shaping final energy use. See, for example, Chong, 2010; Sudarshan and Sweeney, 2008). More profound critiques of the problem point to efficiency's broader accommodation with capitalism's growth imperative (e.g., Walker and Large, 1974). For example, for things like home heating and cooling demand, lower energy use per square foot often fails to mean energy savings overall: efficiency improvements are countered by the growing size of exurban homes (Chong, 2012; and see Knuth, 2010 and many critiques of the LEED certification scheme; EERE (2008) provides a breakdown of these US housing trends).

Sustaining Cities? Confronting Capitalist Urbanism

Finally, growing attention to the connection between energy consumption, climate change and the built environment is shining an interrogatory light on capitalist urbanization. In capitalist property markets like those of US cities, cycles of construction, disinvestment, abandonment, and gentrification are endemic (although the last has excluded many places). The energy and environmental costs of this construction and abandonment have not been accounted for, a lacuna the increase of LCAs has aimed to redress. Climate policies are beginning to support these efforts. For example, Boardman (2007) describes how the UK has used LCA to target major retrofits and demolitions in service of its climate commitments, considering massive demolitions of the portions of its existing building stock deemed unsalvageable for energy performance. Setting aside the troubling social costs of large-scale demolitions, these policies are actually putting in practice the kind of sweeping climate change-associated transformations of the built environment discussed more speculatively in Sayre (2010).

In the United States, these considerations are being applied to a system very much in flux, with broader regional disinvestment exacerbated in the wake of the subprime collapse. "Shrinking cities" and "right sizing" cities are common discourses in Detroit, and many other less spectacularly and catastrophically afflicted places within the former heartlands of the Industrial Midwest and beyond. The Brookings Institution has gone as far as to presents a model for major demolition programs in disinvested US cities, projecting (and supporting) demolition of as much as a quarter of the nation's existing building stock between 2005 and 2030 cumulatively (Mallach, 2012).⁵⁰ This kind of program carries highly problematic political implications given painful historical experiences with urban renewal and the human costs of abandonment and foreclosures. Increasingly, they must also consider energy efficiency and emissions costs. On one hand, energy efficiency advocates might reinterpret disinvested landscapes as major "yield gaps," places where a little reinvestment might have major effect in terms of calculated and priced energy saved. On the other hand, the environmental costs of letting these places fail, and blowing up building booms in fresh greenfields is becoming visible in increasingly prominent ways.

Finally, geographical political economy has developed important insights into the broader laws of motion driving geographical creative destruction – investors' and developers' formation, abandonment, destruction, and rediscovery of built environments

in their broader attempts to accumulate and stave off devaluation of their capital. The geographical creative destruction that has been endemic to capitalism and the increasing global mobility of capital in the current moment threaten energy and environmental redevelopment visions. They suggest a pattern of cyclical disinvestment and transformation that is basically incompatible with efforts to improve and sustain built environments over the long term.

Chapter 4: Green IT and the Problem of “Post-Material” Resources

By 2013, some of the United States’ most prominent cleantech ventures sought to apply to the task of energy conservation approaches being developed around social media and devices in the Internet of Things, in partnership with a new generation of utility DSM programs in California and nationwide or as independent ventures. For example, business models include the use of big data; automation, and a raft of “smart” meters and control technologies; gamification; and other behavioral manipulation schemes to analyze and transform energy use patterns. A wave of start-ups founded in the late 2000s targeted the intersection of energy use, real-time monitoring and reporting of that consumption via “smart” technologies, and endeavors seeking to “big data,” the new reams of information taken in by these devices. Founded in ideas of building automation and sub-metering developed for large commercial buildings and campuses, start-ups now aim to use new information technology tools to develop mass market products that work for small users, including residential users, and that work to transform energy use behavior relatively independent of the buildings that they inhabit. These companies and their visions are an important front in the drive to make energy efficiency a resource, often forming relationships with utilities that might be variously described as symbiotic, competitive, or at worst parasitic. As this smart information technology and its infrastructure pledge to lower everyday energy consumption, they are attempting to mobilize different theories of human behavior, and everyday life and habitual consumption. Finally, they have a complex relationship to finance, and many of these companies look to the successful “financial engineering” of solar energy service companies like SolarCity.

In this chapter, I discuss some warning signs in this wave of activity, a particularly important task because these businesses have been so relatively successful within cleantech development in the United States in general. I argue that these models insufficiently account for the importance of buildings themselves in energy use, and the powerful structuring influence of existing built environments and landscapes. I consider how an alternate model of energy behavior might give greater weight to material culture. I particularly consider how theories of everyday life and regional geography can speak to the connection between energy consumption, buildings, and landscapes. These approaches pay more attention to climatic influences and regional differences in building styles and energy practices than the theories of social behavior that green IT start-ups utilize. They also offer more insight into how history matters in missions to revolutionize energy consumption: what kinds of buildings people inhabit, their age, how durably they were constructed, what technologies they contain, and how they have been maintained. These material questions make behavioral change more or less easy, even if people are made more aware of their energy use: green IT’s voluntarist model of behavioral change can only go so far. They thus point to the ongoing necessity of energy retrofit programs. While complex existing built environments also challenge retrofit bids, these ventures threaten to ignore the problem entirely – a decision that may exploit low hanging fruit for profits while ignoring structures that more fundamentally shape energy use. Finally, I illustrate how geographic investigation can call into question taken for granted practices like air conditioning, massive factors in energy demand that are actually of relatively recent origin. These kinds of destabilization are necessary to developing energy and

greenhouse gas emissions strategies that go beyond the politics of personal responsibility to more profound political changes.

At their most problematic, green IT extends a vision of post-industrial economic development and post-materialism that both underestimates the weight and complexity of material geography and that, in the economic realm, extends a structure of feeling that has also supported the rise of financial engineering as a so-called sector of high tech. Green IT, and the energy services companies like SolarCity that have become major success stories in contemporary cleantech, blur with financial ventures in important ways. This ambiguity has increased their attractiveness to venture capital. I argue that a major factor in green IT's own success within cleantech has been its light footprint relative to capital-intensive technologies including solar manufacturing. While green IT succeeds in the United States, manufacturing has faltered: China rose quickly to dominate this manufacturing in the late 2000s. I contextualize the globalization of cleantech manufacturing with a longer history of US high tech development and offshoring. I argue that financialization played an important role in this transnationalization and the US's refusal to adopt an industrial policy (or, rather, an official industrial policy, as government programs quietly subsidized defense manufacturing, finance, and other favored industries) – as did rhetoric of post-industrialism and post-materialism. The rise of green IT demands caution in this context: does it represent ecological modernization, or simply the ongoing offshoring of the material costs of even a “green” economy?

Energy Efficiency and the Rise of Green IT

Amidst the economic turmoil of the late 2000s, the project of greening US cities and urban economies galvanized political, cultural, and economic activity. Innovative labor-environmental coalitions argued that “green collar” manufacturing work in new environmental industries would ameliorate mounting racialized economic inequality and working class livelihood insecurity in the US. Cities and national governments worldwide took up visions of clean technology development and the green economy. Silicon Valley helped lead this wave, as over a billion and a half dollars of investment poured into the region from the American Recovery and Reinvestment Act (ARRA) and other Obama Administration green economic programs (Recovery.gov, 2013). The wave of start-ups that that investment inspired included large-scale manufacturing ventures, enterprises that simultaneously promised high tech manufacturing innovation and domestic working class job creation. They included companies like Solyndra and other solar panel manufacturers. However, five years later, US recovery funds are expiring and the federal government languishes in fiscal gridlock. Capital-intensive green manufacturing in the US has struggled amid federal turmoil and venture capital's reluctance to invest in large-scale manufacturing. The politicized failure of Solyndra was especially prominent in this slump, but Solyndra was not alone. Pew Charitable Trust's 2012 report, *Who's Winning the Clean Energy Race*, summarizes a disappointing series of years for US cleantech:

The competition among countries for clean energy leadership is resulting in a reshuffling of the old order. In 2012, China advanced its position as the epicenter of clean energy finance...although the United States invented many of the leading clean energy technologies, it continues to underperform in investment and deployment relative to the size of its economy and its history in the field (Pew Charitable Trust, 2013).

Simultaneously, however, a very different kind of “cleantech” has seen booming profits in Silicon Valley and other US high tech centers. Startups like SolarCity provide services and financing for solar panel installation. Similar companies install solar panels, conduct energy audits, and finance building energy efficiency retrofits. And a rising group of energy services marketing themselves as green information technology aims to sell energy efficiency as a resource. SolarCity has been an important model of success for these energy efficiency ventures, but they also have a longer history in moves toward building controls and automation: the rise of “smart” buildings as a concept. Building automation has been a design feature suggested for new high-performance buildings. It has been a measure targeted for the kinds of large building retrofits performed by Energy Services Companies (ESCOs), as they seek the possibilities for energy savings that provide their profits.

Automation includes features such as motion-sensitive or carbon dioxide-sensitive (from exhalation of crowds in a more or less full room) lighting and temperature controls that sense room occupancy, timed faucets or toilet flushes. It has helped spur increasingly fine-grained metering of buildings, interior spaces, and systems and devices (at the frontier). Manufacturers are also developing advanced building materials or prefabricated assembly components like high-performance windows. At the technological frontier, advanced materials and building elements including active phase-change features that actively respond to environmental conditions, external fluxes of daylight or temperature (e.g., “thermochromic” and electrochromic glass). These active features join other building control and automation technologies including heat exchange systems and electronically controlled drives and motors. Proponents argue that these smart building systems can interface with equally smart grids through real-time energy monitoring devices. Multiple companies now offer IT interfaces for real-time tracking of building energy and water use. These real-time systems have been most controversial when they feed information back to energy utilities: “smart meters” provoked controversies when utilities rolled them out in markets like the San Francisco Bay Area. At their most ambitious, these programs propose to link “smart” meters, buildings, and a power grid infrastructure into an integrated system (ACEEE, 2012; Pike Research, 2012c; Jones Lang LaSalle, 2013a).

These technologies generate big data for use by utilities and other entities that hope to develop applications for external management of buildings: remote control of thermostats, utility load management, automated building adjustment to micro-fluctuations in weather and temperature, and other ideas (e.g., Pike Research, 2012c and Jones Lang LaSalle, 2013a). Activity in this area boomed in the late 2000s, although it had earlier expression in “digital home” and wired building visions in the late 1990s digital boom, and of course still further back recalls midcentury speculations about the potential of home and work automation.¹ Critically, this kind of imaginary around smart buildings removes much human behavior from the equation. Some ventures suggest that externally controls thermostats and automated “learning” thermostats can achieve higher efficiencies than conscious human control of building or room temperature. However, the level of building energy monitoring and control envisioned by many of these measures is currently too expensive for most newly designed homes or small energy retrofit projects,

and may be especially suited to large spaces like commercial or institutional buildings anyway.

Green IT and its intersection with energy services has not been confined to these visions of controls and automation. As public utility commissions (PUCs) and utility companies expanded DSM programs in the late 2000s, and a wave of non-utility entrepreneurs including but not limited to more established ESCOs surveyed the field for accumulation possibilities, a wave of start-ups proposed employing the power of big data and other advanced IT applications to transform household and workplace energy use. As of the time of writing, high-profile ventures in the space included Opower (now in partnership with Honeywell), Nest, Bidgley, EnergyHub, EcoFactor, Tendril, Steam, Leaffully, and Auto Grid, among others; the federal government has promoted this field of investment with its Green Button program. Start-ups in this software boom aimed to use energy metering devices to promote energy conservation in a different way than advanced controls and automation: by developing innovative methods for communicating that data to energy users and effecting conscious changes in behavior. The sub-sector boasted some of the most robust growth in US cleantech – a bright spot in an otherwise disappointing picture in the early 2010s. Among successful behavior modification startups, Opower claimed that it had reached 50 million households by 2012, saving them a total of \$200 million in avoided energy costs (Kamal, 2013). (See Fehrenbacher, 2012a, 2012b; Fisher, 2012; Higginbotham, 2012; Van Grove, 2012; Kamal, 2013; Lesser, 2013; and Novet, 2013 for examples of tech media reporting on the sector).

Part of green IT's success today, as I will discuss below, comes from willing venture capital funding – especially because software applications are cheap to produce relative to other kinds of cleantech (GigaOm Pro, 2009a). These technologies also conveniently resemble other software applications booming in the “knowledge economy” today (Newton, 2011). Ventures founded on the connection between new devices, big data, and behavioral change targeted many different kinds of activity in the tech boom of the late 2000s. Proponents have thrown IT sector ideas like “gamification” at other problems, including energy consumption (Pernick et al., 2013). Interestingly, the idea of using high tech to modify energy behavior has earlier antecedents in the New Economy. Vine et al. (1999) discuss similar kinds of high tech behavioral modifications in the realm of energy use – but for an earlier era of frontier telecommunications such as cable television.

More specifically, energy behavioral management bids like Opower, Nest, Bidgley, and their dozens of competitors propose that a big slice of the energy use and greenhouse gas emissions that analyses like EERE (2008) allocate to the built environment can be accomplished by changing the way that people use these existing buildings. For example, building occupants may turn off unneeded lights, lower (for heating) or raise (for air conditioning) thermostat temperatures, or otherwise reprogram their heating and cooling habits. The new wave of start-ups focuses much more on homes and less complex structures than ESCOs and thus covers a narrower range of possible changes, one more focused on household behavior. A central “use value” proposition that these energy behavior change programs take on is that US landscapes are structured for high ongoing energy use, but that habitual experience and historical political strategies have made that energy use politically and socially invisible (e.g., Shove, 2003). For energy efficiency to become a resource in this sphere of behavior change, energy

consumers must become aware of energy use patterns that have become habitual in important ways, conceive of these behaviors as a problem, and take personal responsibility for changing these behaviors.²

Companies' specific business/behavioral change models often included alternate reporting strategies for energy use, from real-time devices with different kinds of display to altered the formatting of energy bills to level social pressure on relatively large energy users. Entrepreneurs have developed dozens of start-ups around various iterations of these ideas. Different start-ups operationalize different theories of social behavior. They draw on rapidly expanding scholarly analysis of energy consumption. (See, for example, Lutzenhiser, 1993; Guy and Shove, 2000; Wilhite et al., 2000; Wilk, 2002; Shove, 2003; IPCC, 2007). In addition, see Wilk (2002) for speculation about how different disciplines' theoretical models might structure different kinds of energy conservation strategies. We can find many of Wilk's hypotheses at work in green IT today. Some of these ventures propose to effect energy conservation through better information provision, suggesting that if people simply understood their energy bills better and could connect their energy costs to specific behaviors that they would make different choices – a behavioral model that draws from neoclassical economics' models of rational choice. Other programs propose social comparison, conspicuous conservation, and shaming, suggesting that if people understood how much energy they were consuming relative to neighbors or competitors that they would be more driven to make changes. Still others suggest the adoption of “gamification” principles, drawing from another fashionable body of thought in Silicon Valley more broadly (e.g., Kamal, 2013) to suggest that making energy use reduction fun will effectively motivate consumers.

As this new kind of energy service company attempts to make energy efficiency a resource, these ventures join retrofit companies in targeting existing buildings and interior spaces. As with retrofits, start-ups base their business model on successfully achieving energy savings. These businesses may collect their profits in the private market. They may also work with electric manufacturers – for example, to develop connections between the smart grid, advanced “learning” thermostats, and big data behavioral management applications.

Alternately, they may partner with utility companies, as a new generation of utility demand side management (DSM) efforts tries to revolutionize its approaches. Utilities seem to hope that these cheaper subcontractors can produce energy savings for less money than weatherization programs. These contractors' return comes from their ability to divert existing consumer utility bill payments; again, expenses that the utility can justify as precluded generation needs. (And of course, earlier weatherization attempts had established a precedent here, supporting a contracting network of energy auditors and contractors – albeit a much smaller one given the limited funding available.) Other enterprises partner with utilities to look not at total energy use but rather at the timing of energy use (i.e., “load management”), trying to shift electricity consumption from peak demand times to less demanding times. These interventions aim to prevent efficiency losses from electric companies having to bring additional peaker plants online to cover high-use periods of the day or other especially high-use situations. Beyond the energy lost to starting up additional generation facilities, peaker plants are often oldest and dirtiest, in terms of both greenhouse gas emissions and criteria air pollutants. Big data approaches attempt to harness utility companies extensive records of energy use data,

surveillance potential increased by the installation of Smart Meters to track real-time energy use.

It is no accident that Opower and many other energy behavioral management schemes have strategically linked with investor-owned utilities: they are thus able to utilize utilities' existing market structures. These include client bases (only slightly less tied to a monopoly provider after the 1990s deregulation wave challenged long-term natural monopoly framing of the market), physical delivery infrastructure, information delivery and marketing procedures, payment systems, "decoupled" cost-recovery structures through PUCs, increasingly detailed external monitoring and data collection systems via the dissemination of Smart Meters, and other critical resources. Contractors and ESCOs have also historically leveraged partnerships with utilities. Currently, energy efficiency retrofit financing proposals like on-bill financing/payment schemes aim to expand this hybrid sphere.

Confronting Unruly Landscapes of Energy Use

Green IT's successful performance is by no means assured. The proposals discussed above envision the actually existing US built environment in highly vague, abstract terms. They place large hopes on the ability of more information provision to alter, and alter durably, complex structural practices.³ Far more than they acknowledge, their claims confront a highly complex, differentiated material and cultural landscape, one that may require finer-grained, more geographically and materially grounded analysis to understand or hope to manipulate. As last chapter's discussion of energy efficiency retrofits discussed at more length, energy use practices and patterns are strongly shaped by geography and by historical development. It remains uncertain whether the kind of software-based energy services companies discussed above are prepared to confront these material geographies and the ways that they can structure and delimit possibilities for radical behavioral changes. Achieving sufficiently deep and sustained transformations in energy consumption will at least require deeper understanding of these behaviors, the ways that they have become habitual and taken-for-granted, and the ways they can be locked in by physical structures (Sanne, 2002).

How should we think about energy efficiency as a resource, and the way that these state and market visions are framing it, as specifically an entrant to an environmental market? In emphasizing how this frontier accumulation vision abstracts from and may founder upon complex material realities in similar ways as more "first natural" schemes, the current analysis draws from an existing body of thought on environmental markets advanced by political ecologists, sociologists of markets, and other critical environmental scholars. As discussed in the introduction to this part of the dissertation, these researchers have examined the labor of framing complex ecological systems as simplified, common, exchangeable quantities and the way that unruly materialities and ecologies challenge this simplification. Political ecologists have pioneered the aforementioned ecological critiques of market environmental schemes in rural environments and resource peripheries. However, given the abstract quantitative framing of important energy and environmental redevelopment visions so far, it is

important to investigate whether energy efficiency as a resource schemes and other new, second nature-targeted environmental markets might encounter equally unruly natures.⁴

For example disparate claims by analysts like McKinsey and companies like Opower draw their power from a similar aggregated, large-statistical framing of the US built environment and its potential to make their cases. Critically, these quantitative pictures are also alike in their opacity: each abstracts from and conceals considerable material complexity that must come up in the attempted realization of its vision. Behind more opaque presentations of the energy potential of existing buildings and interior spaces (the everyday environments that green IT targets for changing practice), we find a diverse array of geographies. It encompasses a built environment that ranges from urban skyscrapers and apartment towers to single-family suburban homes. These homes might encompass nineteenth century row houses, the Victorians and bungalows of late nineteenth century streetcar suburbs, the “minimum houses” of post-World War II rectilinear subdivisions, or the thirty years of split-levels and exurban McMansions of the neoliberal era. These visions also theoretically encompass the buildings of small town and rural America, vast swathes of which are now characterized by manufactured and mobile housing. And as the last chapter discussed, regional geography and history shape important factors in energy use: era of construction, maintenance or lack thereof (shaped in turn by broader trends of regional investment or disinvestment), relative harshness of climate, and so forth.

However, here we run into an immediate difficulty. Established natural science disciplines provide detailed, place-specific ecological knowledge that both allows market proponents to propose ecosystem management schemes and produces a body of knowledge that can evaluate and critique these profit-driven interventions. Despite the fact that built environment production and use is more fully rooted in human systems and thus might be assumed to be more inherently legible to human understanding and control, new mobilization of architects, designers, building scientists and engineers, social scientists, and other disciplines in the field of energy-efficient redevelopment suggests that these patterns pose many unanswered questions and unsolved problems.

However, following capital into these complex urban built environments and “second natures” (Smith, 2003 [1984]) requires engaging different bodies of theory than green IT has engaged: for example, study of everyday life as advanced by feminist and Lefebvrian scholarship and a substantial body of work in geography and anthropology. In the US context, regional geography is due for a critical reappraisal around these questions of the politics of consumption, particularly its work on cultural landscapes, as well as closely related research in vernacular architecture and material culture. Unlike other social science disciplines being applied to and taking an interest in energy behavior, geographers have produced bodies of detailed place-based knowledge that explores buildings, built environments, and their accretion over time; the ways that these historically sedimented structures shape patterns of social practice; and everyday behaviors including energy use. This kind of scholarship has long informed architectural preservation and other historically sensitive redevelopment efforts.⁵

As surveyed in state-of-the field texts and statements like Lewis (1979), Chase et al. (1999, 20088), Wilson and Groth (2003), and Groth (2004, 2007), this ideographic tradition in geography suggests a more richer, more empirically grounded way of “seeing” the built environment, and the ways it shapes consumption habits and broader

cultural practices. This tradition of scholarship envisions the US built environment as a landscape – a complex accreted product of multiple building waves over one hundred or more years that has deteriorated, been adapted and built over, and changed in myriad ways. It scholars have studied the built environment as a living landscape that houses and is constantly reshaped and differentiated by social and economic reproduction. These fields develop a more fine-grained account of built environments in general, focusing specifically on the actually existing built environment and the interface between cultural and social reproduction, the production of space, the construction and lived experience of particular kinds of built environments, and other patterns of everyday life (operationalizing the theorizations of these spheres put forward by Lefebvre (2008), De Certeau (2011), and other social theorists).

In their idiographic function, these clustered fields focus on unpacking the historical geography of particular places, in the form of the accreted material artifacts particular eras produced. For example, these approaches track the unfolding on the ground of historical building waves. These studies track how each of these eras of construction produced structures with distinct kinds of energy use footprints – more or less elaborate physical plants, central heating or not, more or less large building footprints, use of daylighting or not, and so forth. They suggest that there has been varying degrees of intervention in this landscape after its construction – to conserve it or allow it to physically deteriorate over time (with significant energy costs for things like home heating, as we will see), to modernize it or not, etc. And they argue that different places will have distinct mixes of building types and eras based on their development history. For energy and environmental redevelopment purposes, these landscape approaches suggest more grounded built environment assessment and characterization of energy and environmental redevelopment potential than the abstract visions of green IT. This knowledge is critical, particularly because everyday landscapes and material culture have long been ignored by many academic disciplines as mundane (Shove, 2003). Architecture has long been culpable here, focusing on high-design buildings (including new green ones) and ignoring more quotidian structures of vernacular architecture. Historians have often found buildings insufficiently textual as subjects of analysis. However, vernacular architects, landscape scholars, and anthropologists of material culture in a range of countries worldwide have begun to employ these historically and culturally grounded analyses – e.g., Canás and Martín (2004), Ozay (2005), and Renping and Zhenyu (2006).

A critical landscapes approach has the power to better connect within-building processes and flows to broader urban-regional infrastructure including direct energy and electricity provisioning networks. This body of analysis can further bridge artificial separations erected between human and non-human environmental systems by considering buildings and the built environment as environmental objects. For example, pioneering work in the cultural landscapes tradition⁶ by Stewart Brand in *How Buildings Learn* suggests illuminates this environmental embeddedness. Brand's text was a historically important voice in the development of green building that emphatically takes this detailed focus on existing buildings; he directly cites cultural landscapes as well as building science as intellectual influences. Brand discusses buildings as structures ultimately subject to the same forces of weathering and material degradation as other geomorphological structures in environmental landscapes. Some of the forces at work

here are the same forces that physically and chemically break down other material objects like hillsides and rock outcroppings, such as water, wind, and UV breakdown. Socially manipulated materials look no different to these forces than any other environmental object. But many structuring forces here are social. For example, building energy use over time depends upon the initial quality of construction: whether or not structures are “built to last.” Research that examines flows in and through buildings, and the built environment itself as a thing in flux, allows us dig deeper into the processes that deteriorate buildings over time, and their energy consequences. In contrast to illusions of perfect, eternal seals from external environments, buildings gradually lose that separation. As they lose tiny pieces slowly due to weathering, their interior spaces gradually become reintegrated into their surrounding physical environments. It takes increasing amounts of energy to work against that trend, as buildings deteriorate further.⁷

Landscape approaches offer important insights into bids to change energy consumption behavior. Critically, they question how buildings and behaviors dialectically shape each other over time. They also explore how behavioral choices can be restricted by existing buildings and built environments. Ambitious visions of controlling human energy use like those advanced by green IT confront considerable lacunae: if everyday environments have historically been understudied, behavior in these spaces has been even more ignored. Shove (2003) describes the quotidian invisibility of energy use in industrial countries as “inconspicuous consumption.” It enables a structural backbone of practices that lies under more conspicuous positional goods (Bourdieu, 1984). Undergirding more dramatic contemporary (classed, raced, gendered and cultural politics-laden) struggles over consumption practices and their representations today, it has set a minimally “decent” standard of living. Although electrification battles remain active in many developing countries, half a century or more of intervening time after the most heated of these conflicts in the United States has left these baselines a largely unremarked sphere – with important exceptions like the energy crises of the 1970s.

Geographical scholarship can help us more deeply problematize energy use practices, necessary exercises in creating political interventions that go beyond neoliberal politics of personal responsibility and voluntarism. For example, historically informed landscape approaches call into question the maintenance of discrete interior spaces separated from ambient diurnal and seasonal temperature fluxes, practices that as discussed constitute a massive drain on fossil energy and source of greenhouse gas emissions (and see Chong, 2012). Landscape approaches provide insight into the problem of reducing the amount of energy used to heat, ventilate, and cool buildings. US buildings maintain a vast constellation of interior spaces separated from external climates, at massive energy cost. As the last chapter discussed, these needs dominate total energy use in US homes (less so commercial spaces). Landscape histories highlight the relative novelty of this design trend. Behavioral change options will vary greatly depending on what kinds of structures individuals and households inhabit, as much as questions of homeowner versus renter status that have garnered more attention as a constraint on behavioral change.⁸ Framing energy use in terms of landscape and geography draws attention away from relatively low hanging fruit like lighting and small-scale behavior modification and towards more powerful determinants like building size, age and maintenance, and other structural features. These features vary widely across single-family homes of different eras, multi-family homes, mobile homes, skyscrapers, older

commercial strips and new big box exurbs, and the many other highly diverse material landscapes now being commonly envisioned in energy and environmental redevelopment schemes.

Cooper (1998), Crowley (1999), Shove (2003) and Ackermann (2010), among other historians of material landscapes and everyday building technologies, examine how changing standards of thermal comfort became codified and universalized by corporate actors and engineers. They discuss changing ways of inhabiting homes (e.g., abandoning the mid-day siesta traditionally used to combat midday heat). More modern home design often leaves off these traditional features for coping with heat and cold, which might include porches, windows with shutters, fireplaces, basements, particular construction materials and orientations, and a range of other features specific to specific climates. Many of these regional vernacular architecture elements evolved over generations, encoded in folk tradition (Deetz, 1996). In many ways, central space heating and cooling have made it possible for builders to abstract from regional differences, willfully ignoring climatological conditions in favor of socially produced uniformity – a smoothing out of difference exacerbated by the use of climate control in cars, institutional and commercial buildings, and workplaces.

Only a few of the research programs and green IT start-up companies surveyed engage material environments or the kinds of structural limitations discussed here. Ultimately, enterprises that attempt to change energy behavior but take a limited interest in how this behavior is shaped by physical structures risk only being able to control a small amount of energy use behavior. Thus, landscape insights can help expose the limitations of green IT's vision. They point toward the work being done by retrofit initiatives that take the problems of existing geographies more seriously, and who are willing to take on the challenge of developing more capital-intensive interventions and accumulation visions. Within energy retrofitting, fields of practice advancing these historically and geographical thick understandings of US material landscapes are indeed beginning to exploit the opening created by the rise of national interest in built environment renovation and LCA approaches to construction. And as discussed in the last chapter, the current flood of interest has not been lost on the architectural preservation community, the group with most established interests in the long-term conservation and reuse of existing buildings and landscapes. The involvement of architectural preservations is critical, because they are one of the few bodies of practitioners who have currently developed a body of expertise in existing US built environments and their geographic variation.

Post-Industrialism, Post-Materialism, and the Financialization of US High Tech

Green IT's experience in the late 2000s and early 2010s speaks to broader dynamics in US high tech development today: a key question is why these software companies have boomed while many other types of cleantech faltered. I argue that the relative success of green IT can in part be attributed to in part to the embrace of a "post-industrial" ideal in Silicon Valley, and within broader US economic development policies. Proponents have integrated this notion of a post-industrial economy, conceptions of a service economy, and even a "post-material" economy. The commonalities between these notions,

ecological modernism and its vision of dematerialized economic growth, and new developments in financial practice bear more scrutiny. The influence of this thought on financing practices, start-up culture, and ideas of success in places like Silicon Valley has disadvantaged more capital-intensive green manufacturing.

In the aftermath of the 2008 financial collapse, the United States was one of many national governments that embraced rhetoric of a green economy: a perceived pathway to economic recovery, and potentially the rejuvenation of troubled manufacturing regions that had been gutted by over thirty years of offshoring. US green economic interests faced the competition of a Chinese cleantech boom, as the country supported its clean energy manufacturers with a stimulus package rivaling the US's (Pew, 2010 places it second at \$47 billion; HSBC, 2009 argues that it was the world's single largest at \$221.3 billion). In rhetoric surrounding the rollout of its stimulus measures, the White House framed its green investment in terms of global economic competitiveness and rejuvenated US manufacturing:

We know the country that harnesses the power of clean, renewable energy will lead the 21st century. And yet, it is China that has launched the largest effort in history to make their economy energy efficient. We invented solar technology, but we've fallen behind countries like Germany and Japan in producing it. New plug-in hybrids roll off our assembly lines, but they will run on batteries made in Korea...I do not accept a future where the jobs and industries of tomorrow take root beyond our borders (White House, 2009).

Yet in the current moment, the US's fears prove to have been well founded. In 2012, overall cleantech investment fell significantly in the Americas while Asia, flush off of nine years of growth, became for the first time the leading regional target for alternative energy investment – at \$101 billion, over double the Americas' regional investment (\$50.3 billion) for that year (Pew, 2012). China dominated this investment, although by 2013 overproduction in the sector (notably the glut of solar panels) had shaken many leading Chinese companies. In Pew Charitable Trust's *Who's Winning the Clean Energy Race* 2012 update, the organization reported:

In 2012, clean energy investment in the United States was down 37 percent, to \$35.6 billion...ongoing uncertainty surrounding [the wind production tax credit] and other policies is emblematic of the lack of a consensus among American policymakers, and it contributes to the halting, disappointing U.S. performance in the worldwide race for clean energy jobs, manufacturing, and market share (Pew Charitable Trust, 2013).

Although multiple factors are to blame, and each company's case contains contingent issues,⁹ an important factor in these troubles has been regional venture capital's unwillingness to fund or to sustain funding for these large, capital-intensive industrial ventures.

The financialization of cleantech is a major cause for concern. I understand financialization here to mean the increasing power of private finance to determine what kinds of cleantech succeed in the United States. A key front in neoliberal rollout was pressure on the US government to disavow formal industrial policy, to rely on finance capital and other private sector to direct and maintain real economic growth – critically featuring visions of finance leadership in the development of high tech frontiers. Yet, as many authors have discussed, finance's ability (and imperative in an increasingly competitive sector) to relocate to seek higher rates of return has often worked

antithetically to large-scale industry's need for long production times and patient investment to recoup the value of its fixed capital. In more recent history, critics charge finance with being as happy with wasteful speculation or with gutting corporations for profit as with supporting production and real economic growth, language that as we have seen was resurrected in the wake of the 2008 financial collapse. Conversely, finance capital claims its role as necessary to support industrial growth. Critics like Henwood (1998) claim that in fact corporations' self-reinvestment of their profits has been far more important, even as even many financiers themselves believe this finance-centric version (e.g., Ho, 2009). Despite the leverage of ARRA investment, the state has not taken the power to establish industrial policy and shape technological development from private finance. High tech financing structures developed in Silicon Valley over the last twenty five or more years, notably venture capital, is thus meant to support these new industries.

The US's existing models for financing and developing non-military high tech have proven unresponsive to the capital-intensive clean energy manufacturing ventures that played a central role in green economic visions and green collar jobs hopes. Venture capital has so far proven far friendlier to green IT. Energy services start-ups and related green applications have required little fixed capital and create few working class jobs (Next10, 2009). However, they have clear advantages for a culture of financing that has become used to the low capital intensity and relatively quick incubation times of software companies, particularly in today's social media application boom. Industry analyses make venture capital's investment interest in green IT – and its problems with capital-intensive cleantech – clear. For example, in 2009 a quarterly report by the technology market analyst GigaOm reported:

The smart grid, in particular, continued to attract both media buzz and venture capital investors (who couldn't seem to contain their excitement over finding cleantech investments that looked just like traditional IT plays: low capital, quick return, little to no technology risk). In fact, there was so much interest in the consumer-facing software component of the smart grid – home energy management systems – that there is already talk of a “bubble” in that space (GigaOM, 2009b).

Similarly:

Clean Web, Green IT, digital green, or whatever you want to call it: It's become very clear that investing in capital-intensive cleantech manufacturing technologies is a lot harder for most investors, than investing in software, computing, mobile and the web. Which is why new phrases called Clean Web, and digital green, have emerged to explain startups and big companies that use digital technology to address resource constraints like energy, water and food (Fehrenbacher, 2012c).

And according to CleanEdge's 2013 report on the state of clean energy investment, these green IT companies may primarily be attractive as IT, and signal Silicon Valley's unwillingness or inability to commit to cleantech at all when quicker return booms are in the offing:

Clean tech's decline, however, matched a similar downward trend for total VC investment in the U.S., with clean-tech investments still representing nearly one-fifth of all VC activity in the U.S. during 2012. This share could quite easily shrink in coming years as clean-tech IPOs remain all too rare and mainstream VC firms begin to shift focus back to other areas – particularly to less capital-intensive sectors with shorter business life cycles like software and web-based startups (Pernick et al., 2013, p. 6).

Venture capital's difficulties with large fixed capital cleantech reflect longer-term patterns in its operation. The storyline about venture capital's functioning told by the popular press emphasizes the distinct role that this financial subsector plays in financing and guiding high tech start-ups in very early stage development, ushering them from speculative research to maturity, in the form of initial public offerings (IPOs) on conventional stock exchanges. Especially since its role in the New Economy boom of the 1990s, media accounts have touted venture capital as highly patient and willing to take risks on promising but unproven innovations, a branch of finance far more conducive to real economic growth than the characterization above – and organized in response to the failures of those conventional corporate financing structures. It is a telling manifestation of neoliberal assumptions that the popularly imagined response to this problem was the development of a new kind of finance, rather than a move by the government to play a greater economic development role. This pro-venture capital argument has helped animate statements that declared that the United States did not need state industrial policy, and broader claims that finance could rhetorically assume the role of the “brain” of capital (including for manufacturing development) instead of a capitalist state. Chapter 7 picks up this discussion.

Histories of Silicon Valley's rise to global high tech leadership have often advanced arguments for venture capital's importance – although they also acknowledge the economic region's historical origins in military R&D and investment (Saxenian, 1996; Kenney, 2000; Kenney and Florida, 2000; and see Turner, 2006 for more on this military history). This argument provided important strength to advocates for US post-industrial development and comparative advantage in a globalizing world. Silicon Valley's IT industries were early leaders in the transnationalization of production, outsourcing manufacturing to East Asia and other locations (Saxenian, 1996). Advocates claimed that Silicon Valley could retain research and development, financing, design, and marketing functions domestically while shedding lower-skilled functions. Saxenian, Kenney (2000) and others have analyzed the complex social structures that had engendered the region's innovation culture – with an eye toward other places using it as a model, but also suggesting how difficult trying to replicate these kinds of dense networks from scratch might actually prove. As well as other regional social-institutional structures, they suggest persistence in existing high tech regions stemming from the presence of venture capital networks in Silicon Valley and the difficulty of building them elsewhere from scratch (the role of “angel” investors is also important here, since according to Auerswald and Branscomb, 2003 among others they have historically made most investments in their own regions).

However, more rigorous accounts of venture capital functioning have cast doubt upon this characterization of venture capital's role. Auerswald and Branscomb (2003) emphasize that special sector of finance notwithstanding; venture capital must still be treated as finance capital:

Popular press accounts notwithstanding, venture capital firms are not in the R&D business. Rather, they are in the financial business. Their fiduciary responsibility is to earn maximal returns for their investors. They do this through a complex set of activities that can be summarized as buying firms low and selling them high. Venture capitalists do indeed back high-growth, new ventures. In many cases, though not the majority, they support firms that are bringing radical new technologies to market. However, even when venture capitalists do

support technology- based enterprises, they prefer to support firms that have at least proceeded beyond the product development stage, i.e. firms that have completed ...early stage technology development...As the median size of venture capital deals has increased and the pressure to provide attractive returns to investors in mammoth funds has intensified, venture capital has tended increasingly to flow to projects in later stages of development and to already-proven technologies (Auerswald and Branscomb, p. 233)

Auerswald and Branscomb (2003) also argue that other actors play a critical role in early stage technology development finance – the federal government, corporations, Angel investors, and smaller sources like universities and state governments. And, of course, state military investment has played a significant ongoing role, via DARPA and military subcontracting (Markusen et al., 1991; Kenney and Florida, 2000; Auerswald and Branscomb, 2003; Block, 2008; Block and Keller, 2011). National labs, particularly Lawrence Berkeley National Lab’s Center for Building Science under the enduring influence of Art Rosenfeld, have conducted pioneering research on energy efficiency in buildings and appliances since the 1970s – critical basic and applied research for green economic ventures today (Hirsh 1999, pp. 147-151); DARPA also partnered with the DOE, General Electric, and Westinghouse during the 1990s on natural gas turbine development (Block, 2008).¹⁰

Block (2008) argues that US governmental industrial R&D policy was never restricted only to defense industry spending and development assistance, even during the rollout of neoliberal attacks on over state industrial policies over the last thirty years. He points to a history of concealed non-defense industrial policies rolled out during the Reagan and both Bush administrations, with a break of overt technology policy under Clinton, programs fought by Republicans in Congress; highly influential in the early history of Google and other leading technologies and companies today. He unpacks the delicate Republican Party balance between preaching rhetoric of state rollback to free market ideologues and meanwhile continuing actual support for particular industrial interests: “big business support of market fundamentalism is not principled, but strategic, since large firms are heavily dependent on government providing them with subsidies, a favorable regulatory environment, research support, protection of their ‘intellectual property,’ and reliable backing overseas” (Block, 2008, p. 183).

According to Block, much of successive Republican administrations’ strategy for papering over this internal ideological disjuncture was to continue targeted developmentalist policies while formally denying this kind of approach, trusting that the public would not look too far into the details. He finds that the industries supported often pursued “low road” labor policies, contributing to manufacturing jobs outsourcing and the erosion of US working class jobs and economic security, a finding consistent with other commentators’ analyses of the neoliberal advance (Peck and Tickell, 2002; Harvey, 2005). Pointing to one example of how this conflict could become visible, he recounts George H.W. Bush’s 1990 firing of a DARPA director for too-obvious deployment of the agency as a public sector venture capitalist (p. 184).¹¹ The pre-history of this “picking winners” kind of critique of state agencies, one that would become a common Republican allegation against the Obama Administration’s loan guarantee to Solyndra and other targeted cleantech subsidies, is telling: Block argues that in this past instance, the problem was not DARPA’s practices but that they were allowed to become too publicly visible in this instance.

According to Block's analysis, this concealed US developmentalism was highly vulnerable as continuing policy, given the underlying hypocrisies involved. And indeed, Obama Administration's move toward overt cleantech policies, other advanced manufacturing promotion, and overt US working class jobs creation in manufacturing faced critique as usurping the role of venture capital and other market actors well before Solyndra's politicized failure. Certainly, this hostility has contributed to the widespread misrepresentation and underestimation of the policies that the Obama Administration did advance under ARRA and subsequent programs, notably including ARPA-E (e.g., Grunwald, 2012a, 2012b). The full effects of this advanced energy research remain to be seen. However, following Hess (2012) and Mulvaney (2013), we can find continuing neoliberal logics built into these programs, notably, in their insufficient provisions for moving capital-intensive new technologies to the commercialization stage – something the Chinese government has done far more actively (and see Berger, 2012; Block, 2012; and Ezell, 2012 for broader critiques of this problem in current US innovation policy). In other words, venture capital has been unwilling to perform this task, and the federal government has not acted ambitiously enough to fill this gap in investment and other assistance or to more fundamentally restructure cleantech manufacturing and other capital-intensive advanced technology in the civilian sector (including reconsidering the resources still spent on military R&D). Like ARPA-E, the developing cleantech investment activities of corporate and Angel investors require more examination – particularly considering large investments being made by Google (for clean energy sources to power its energy-hungry data centers), Apple, and others.

In the broader picture, an important question is to what extent financialization has itself constituted US “industrial” policy, and been a tacit beneficiary of many discussions of a post-industrial US economy. Advocates sold the rise of US finance as part of a broader secular shift towards a “post-industrial” economy (Bell, 1973) – full stop in the development of capitalism, and as part of US global comparative advantage particularly. They argued that expanding possibilities for rapid global communication and transportation enabled a deepening transnationalization of industrial production and correspondingly transformed forms of global “comparative advantage.” Proponents claimed that US industrial decline was in fact Schumpeterian creative destruction, framing the rise of post-industrialism as the evolution of the US economy away from a manufacturing base to more tertiary command functions.¹² The policy corollary to this framing was that it would not need to rescue its manufacturing or establish an overt industrial policy. Proponents envisioned a new national role characterized by high tech innovation, design, and global provision of business services and headquarters functions to transnational producers. Thus, the United States could utilize its argued strengths in education and design-innovation to retain its high value added position in production chains (and ability to extract surplus value). Critical among these global control functions and envisioned durable US comparative advantage and maintained power was the provision of capital and financial expertise, as financial advocates sold it as a technologically sophisticated industry producing intangible “products,” derivatives and other specialized risk management instruments (Shiller, 2003, and for more analysis of this phenomenon see Henwood, 1998; Ho, 2009; and Wójcik, 2011, 2012; among others). To the degree that post-industrial arguments are a stand-in for financialization, longer *durée* accounts like Arrighi (2010) engender questions about this development as a

secular change, versus a manifestation of a recurrent pattern in capitalist powers in experiencing a period of stagnation at the tail end of a period of accumulation and growth in the real economy.

“Financial Engineering” As Cleantech?

The late 2000s wave of interest in solar panel installation, energy efficiency retrofitting, and other building and real estate-tied arenas of green activity has also commanded the attention of financial institutions. Investors and “financial engineers” in this field similarly include both financing-oriented start-ups and a range of mainstream financial players, here including the many actors who came to specialize in real estate finance over the last thirty years. Collectively, they are developing a range of new instruments for financing energy retrofits and other green interventions in building practices and built environments – which, like solar, can carry a high initial price tag. With their role in the development and mainstreaming of energy efficiency financial instruments like property assessed clean energy (PACE) loans and utility on-bill financing structures, among other proposed schemes, financial actors are making a claim to the resources and expertise to tackle climate change’s massive investment needs. And they are attempting to use their participation in current federal programs like the Better Buildings Initiative to help rebuild the industry’s hegemony and mantle of neutral technical expertise for economic development. Financial institutions now involved in the sector encompasses major players, with institutions like Deutsche Bank, Bloomberg New Energy Finance (founded in 2004 and acquired by Bloomberg in 2009), Citigroup (one of the initial “partners” in the Obama Administration’s Better Buildings Initiative – White House, 2011b), among others particularly trying to shape new energy markets.

However, we must question whether finance capital has the inclination or ability at the current moment to adopt the kind of patient capital strategies needed for the kind of long-term investment. As subsequent chapters will explore, financial institutions are developing their own accumulation visions around environmental change. In a critical way, the fight here is over what kind of powerful and deep-pocketed actors can cast themselves as the “brain” of capital in the current moment. These actors will define what responses to climate change – and its massive investment requirements/opportunities – will look like, and whose interests will be protected or advanced in the process.

For example, financialization can also include the growing propensity for financial companies and “financial engineering” to be *themselves* defined as innovative cleantech. As discussed, an important front for venture capital investment at the time of this writing is so-called Green IT and energy services applications. However, even as the lines between the green economy and “knowledge economy” become indistinct (Newton, 2011), another significant and problematic blurring is occurring: with the financial sector itself. Key green IT and energy services companies at the current moment are deriving their core business model and profits from providing consumer financing for advanced energy technologies. And notably, some of these financial schemes are based on an ability to exploit federal ARRA tax incentives for renewable energy projects, an investment field that has come to be known as “tax equity” investment. Companies including SolarCity and SunRun, prominent solar panel installers, have been pioneers in

this hybrid energy/finance field. Critical commentators in the tech press have begun to note that these ventures function more like financial entities than tech or service companies. Woody (2012) cites Anthony Kim, a researcher at Bloomberg New Energy Finances: 'I would consider SolarCity not a solar company but a financial engineering company that has expertise in solar.'

These start-ups promote long-term leasing arrangements, cutting the upfront costs of financing panel installation for consumers (which may run to \$30,000). Their customers instead make monthly payments on a 20-year contract, while the solar lessor retains ownership of a contract to maintain the panels (Woody, 2011b). But tax equity strategies have meant that these programs also served as a channel for a range of banks and companies like Google to reap the benefits of the federal government's green economic programs (typically via dedicated investment funds). Critics also argue that these companies thus cleverly mine federal subsidies to homeowners for private gain. According to Woody (2012), tax equity investors like Credit Suisse, U.S. Bancorp, Google and utility PG&E have poured \$1.57 billion into 23 SolarCity funds that have fueled the company's breakneck growth because they receive a 30 percent tax credit based on the value of the solar systems installed." And ironically – particularly given their exploitation of federal cleantech manufacturing funding¹³ – these installation-end companies have profited from the global glut in solar panel production and boom in Chinese sourcing that helped take down advanced US solar manufacturers like Solyndra; they benefit from panels' now-cheap prices (Cardwell, 2012). Critics thus argue that financial tech companies like Solyndra help offshore solar panel production, directly profiting from the production of cheap panels in China and undermining efforts to grow that manufacturing in the United States.

Woody (2011a, 2011b, 2012) and other industry analysts project "solar securitization" as a major incoming phase for the industry, particularly as ARRA tax credits expire. Securitization would involve the bundling of solar leases made by SolarCity and other installers into asset-backed securities for sale to investors looking for a steady cash flow over time – theoretically pension funds, insurance companies, and other "patient" capital (although we can recall similar arguments made about home mortgages even as the flurry of subprime lending changed the composition of finance capital involved in the sector). This market is still nascent, and ratings agencies are shy in the wake of the subprime collapse, and with such an untried market – the future value of solar panels is unclear, as is the ongoing solvency of leasing companies over the twenty plus years required.¹⁴ Entrepreneurs in the sector claim to only lend to "creditworthy" investors – in today's context, inevitably classed and racialized exclusivity and exclusion becoming once again a selling point in the home lending sector, as so often in the past (see e.g., Freund, 2010 on comparably neutral language of creditworthiness employed to justify racial redlining in the frontier expansion of mortgage markets to the working and middle class post-World War II).

Toward a Conclusion

The trends outlined in this chapter suggest that concepts like post-industrial development and material production are doing significant work at the current moment, to promote

green IT and other energy services and also to support a distinctly financial vision of cleantech. Important now is how high tech discourse is expanding its ideas of post-industrialism and post-materialism to encompass ecological modernist visions of the green economy: arguments that conceptually reconcile environmental preservation and economic growth by envisioning industries that reduce the material, energy, and greenhouse gas emissions intensity of accumulation.

The potential for slippage between ideas of post-materiality within ecological modernist ideas in and financial visions of accumulation is live and troubling, particularly as many players in both fields aim to develop radically new kinds of economic value and intangible resources. Green economic proponents argue that developing new forms of private property in environmental processes and unenclosed nature, for example traded carbon, can drive accumulation. Their arguments bear considerable similarity to storylines of innovative immaterial production and financial engineering that banks developed around subprime mortgages, derivatives, and other exotic financial products in the 2000s; stories that helped facilitate the financialization of the US economy and everyday life. Now, entities like Deutsche Bank are use green versions of these logics to justify investment in financial tech companies, weather derivatives, green real estate investment trusts, and other kinds of financial instruments as innovative engineering at the frontiers of the immaterial economy (DBCCA, 2011).

Although industrial core ventures are being unrolled in a far different context than the resource peripheries that have been hotspots for green accumulation by dispossession on other fronts of market environmentalism, I argue that reluctance to support more patient, capital-intensive enterprises presents similar risks of ephemeral financial speculation and accumulation by dispossession, as opposed to real economic growth and “virtuous” accumulation via repatriation of technological super-profits. Moreover, by growing IT applications domestically while continuing the transnationalization of manufacturing, US cleantech threatens to make the offshoring of the manufacturing, and the potential energy and emissions costs that even “green” manufacturing entail, stand in for genuine ecological modernization.

Chapter 5: Making Green Real Estate Markets

The late 2000s witnessed a major wave of green building. Markets for green construction and retrofits of existing buildings boomed, in the United States and in rising cities and economies worldwide. In the US, these efforts received a major boost from government rhetoric of green economic development and from a wave of broader interest in greening in the aftermath of the 2008 collapse. Conventional real estate market analysts did not miss the fact that a green building market once the province of niche players and consumers became in the aftermath of the property market collapse the hottest – and sometimes the only – game in town. In the fraught investment climate of the late 2000s, even groups traditionally hostile to environmental action like the National Association of Home Builders (NAHB) and the US Chamber of Commerce supported elements of this transition. Beyond NAHB and the residential real estate developers it represents, real estate industry participants including commercial developers, major and venture finance interests, insurance and reinsurance companies, property appraisers, large building materials suppliers, and conventional construction industry interests quickly became major players in a field hitherto dominated by smaller, more specialized, more traditionally environmentally progressive actors. This ongoing movement, and the influx of new actors and money that it has brought, has altered the practices, driving concerns, and very identity of green and energy-efficient building. Even as post-subprime crisis US real estate lingered in recession, these actors initiated efforts to create a new financial architecture – property certifications, real estate appraisal protocols, financialization practices, and secondary markets – that they envisioned would spark a new wave of green construction.

Green building initiatives and certification schemes, most prominently the US Green Building Council's Leadership in Energy and Environmental Design (LEED) standard, consider energy efficiency but also embrace a broader set of environmental concerns – forest resource protection, maintenance of water quality and quantity, solid waste reduction and recycling, improvement of indoor air quality, transit accessibility, and other priorities in addition to reduced fossil energy use and avoidance of its associated greenhouse gas emissions. Many of the environmental benefits sought via these measures are not currently quantified or priced, although ecosystem services advocates are attempting to change that (Gómez-Baggethun et al., 2010). Evaluating green buildings' achievements has thus often been a primarily qualitative, holistic, and use value-based endeavor. Moreover, despite their ability to quantify and price some benefits of building energy efficiency, many builders, self-builders, and consumers of high energy performance buildings (e.g., building certified to particular standards like the Environmental Protection Agency's Energy STAR or super-high-efficiency Passiv Haus requirements) have been motivated by similarly powerful, incalculable values – particularly as the connection between building energy use and anthropogenic climate change has become increasingly obvious.

These established logics and motivations are now in flux in a changing real estate industry. With the broader US embrace of green building, real estate industry players and academic real estate centers have become increasingly serious about using market analysis to discover a premium for certified-green property: a reliable and numerically

significant market value over and above that of otherwise-comparable conventional buildings. Green building market proponents have moved beyond anecdotal claims (Taylor, 2009) and qualitative justifications for this premium – that, for example, green office space might command higher rents or lower vacancy rates because its tenants are more comfortable, healthier, and derive satisfaction from these spaces' contribution to a broader social vision. Leading studies now, aided by the recent dramatic increases in numbers of buildings certified green and energy-efficient, statistically compare large-n samples of properties to find and publicize these premiums (Eicholtz et al., 2010; Fuerst and McAllister, 2010; Miller et al., 2008). This vision and its prospects are ultimately grounded in urban property markets. They are also connected to the way that green/energy efficiency premiums, if present, link to other markets and commodity price movements – for energy and, if market boosters succeed, for tradable greenhouse gas emissions.

In this chapter, I explore the strategies that green building advocates are using to make these pieces of property valuable, and more valuable than non-green property. They have succeeded in this endeavor, at least for some classes of property in certain urban real estate markets. I delve deeper into the market creation dynamics that must be harnessed to make green and high energy performance property a premium niche within US real estate markets, and the real estate, construction, and finance interests that are concentrating on new ways to sell green and high energy performance buildings. I discuss these framings' relationship to a broader set of natural capital proposals and explore subsequent academic-industry research initiatives to formalize this emerging value within real estate appraisal, financing, and more general practice. I provide historical-theoretical context on the complex logics of real estate and land value appraisal, practices drawing from a long history of mainstream and heterodox land economics but now in transformation – even before the current explosion of green valuation proposals.

The rise of green building is not only significant for real estate developers: financial institutions have also taken notice. Today's real estate markets, particularly those the wealthy and growing cities that have been hotspots of green building and retrofitting activity, are increasingly indistinguishable from financial markets. Although real estate and land have long been objects for periodic waves of financial speculation, a wave of novel financial instruments including real estate investment trusts (REITs) and commercial and residential mortgage backed securities (CMBSs and RMBSs) has helped make property markets increasingly legible to investment banks and large institutional investors. These new financial players joined more traditional twentieth century investors in urban commercial property, corporations and life insurance firms. These new instruments and investors have also made property investment more volatile, shuffling capital between buildings and places with greater ease and rapidity. Green property markets will roll out in this existing financialized context. These dynamics have helped produce a wave of new financial instruments that aim to promote greening and to enable speculative investment in green buildings and infrastructure. They join other instruments aimed more specifically at energy efficiency retrofits and recouping upfront investment in efficiency through innovative financing. Green building investment and financial instruments, like the value of green that is independent of existing energy markets, is a far more ambiguous proposition. Given much of its value from demonstrated willingness to pay, i.e. the notion that something is more valuable because enough people *think* it is,

this concept is less subject to value-testing than energy efficiency. As such, the ways that failures in green claims may manifest is an open but highly significant question: will its failures manifest chiefly as financial crises? In other words, might some of these schemes support financial accumulation, even if operating on shaky real ground in terms of greening?

This question is critical in the aftermath of the subprime crisis, in the wake of failures in instruments that rested on shaky foundations and the financialized accumulation by dispossession that these failures produced. Critical among the constitutive abstractions and silencings of new green programs, like subprime mortgages, is the way that many have (not) dealt with the problem of effective demand. The current wave of financialization schemes proposes to further complexify an already-dense landscape of credit and debt. They risk extracting yet more value from populations already staggering under the ongoing effects of the recession, and the thirty years of increasing working and middle class economic insecurity that had preceded it. Some proposed green financing schemes have already foundered on this effective demand and “creditworthiness” problem. These failures are one reason that the most successful parts of the sector today are Class A commercial buildings in cities like San Francisco. These socio-economically and geographically exclusive strategies fall short of the bold visions of mass-market green building framed by public and private actors after the 2008 collapse.

A Green Wave

As real estate markets experienced ongoing foreclosures and depressed prices in the aftermath of the subprime collapse, developers, construction interests, and real estate-involved financiers cast around for new growth possibilities. The wave of interest in high energy performance and other “green” buildings and built environments prompted by American Recovery and Reinvestment Act (ARRA) funding and other Obama Administration programs, the energy efficiency retrofits described in the last chapter, and broader green economic development provided just such an opportunity. According to McGraw-Hill Construction (2010), the value of US green building starts increased by 50% between 2008 and 2010, to \$55-\$71 billion, and made up 25 percent of all new construction activity in 2010; it projected the green building market to reach \$135 billion by 2015.

Subsequent market reports have expanded upon these booming growth projections. By 2011, the value of green building in the US had grown to \$78 billion; it was estimated to make up 44 percent of commercial and institutional construction and 20 percent of the residential market (including both new homes and renovations) in 2012 (McGraw-Hill, 2012a). That 2012 analysis projected that the US’s total non-residential and residential new green building market to reach \$204-248 billion by 2016.¹ And according to McGraw-Hill Construction (2013), global real estate has made a major turn toward green, particularly in commercial space, institutional buildings, and retrofits and renovations overall.² It reports:

A major sea change has occurred since McGraw-Hill Construction’s 2008 study of the global green building market. At that time, ‘doing the right thing’ was the primary trigger for green building...however, green building is increasingly seen as a business opportunity. Client

demand and market demand have become the dominant forces in the market...combine this with the dramatic growth in those who consider lower operating costs and branding/public relations to be important drivers, and it becomes clear that the market is being motivated by the bottom line (McGraw-Hill Construction, 2013, p. 6).

Pike Research (2010) estimated that the global square footage of certified green building space world would increase 780 percent between 2010 and 2020, from 6 billion to 53 billion square feet – most of this space commercial and certified under the Leadership in Energy and Environmental Design (LEED) standard in the US or BRE Environmental Assessment Method (BREEAM) in Europe. It projected that China and India would be responsible for 30 percent of new certifications. Furthermore, it argues that green buildings are rapidly becoming the *standard* expectation for Class A office space globally, a major development.

Other important analyses of green real estate markets from financial institutions and real estate industry players include RREEF (2007, 2008, 2010) (Deutsche Bank's giant real estate funds group)³, McKinsey & Co. (2009), Deutsche Bank Climate Change Advisors (DBCCA) (2010), Next10 (2010) (on California commercial real estate), Urban Land Institute (2010), Jones Lang LaSalle (2013a, 2013b), and PriceWaterhouseCoopers LLC (PwC) and Urban Land Institute (2013) – a mounting literature.

New Resources in Real Estate Markets

As important as energy efficiency as a resource is, it is only part of what is motivating this green wave. New resource schemes take on complex valuation dynamics in a sphere which after all is the established one in which buildings are valued, exchanged, and harnessed for rent: i.e., real estate markets. Production, value appraisal, and exchange have long worked in distinctive ways in this sector.

Do Green Features Add Value?

It is possible to get a sense of the often-peculiar operation of US real estate markets via some brief exploration of recent historical attempts to open up green and high-energy performance niches in these economic spaces. Historically, many consumers of buildings designed or retrofitted for energy and/or environmental performance have been motivated by public welfare considerations, particularly as the connection between US built environment energy use and anthropogenic climate change has become increasingly clear. Unsurprisingly given these motivations, governmental building, educational facilities, non-profits, and other institutions with and educational and public welfare mandates dominated early green building markets (Cidell, 2009). They have voluntarily gone beyond existing building codes, in places where they exist: energy and green building requirements and enforcement vary considerably by state in the United States. And they have often voluntarily paid more upfront for green features. Some actors with this kind of ideological motivation certified buildings to standards like LEED standard, the US Department of Energy's Energy Star certification, or other standards like Passiv Haus's super high efficiency requirements, but others did not even pursue this kind of formal market visibility for their ideologically motivated built environment interventions.⁴

Even for buildings that obtained green certification, translating investment in ostensibly better-than-average energy and environmental performance into exchange value, i.e., superior real estate prices or rents, was long an uncertain prospect. Discussions at the ACEEE's Energy Efficiency Finance Forum in 2012 (ACEEE, 2012) revealed that real estate appraisers were long without the tools to recognize the use or exchange values that these features might add to buildings – even for attributes like high energy performance that require no ideological conviction to convert into reduced utility bills. Frustrated anecdotes from green builders in the residential sector have included stories of granite countertops or backyard Jacuzzis being “counted” as added home value, while superior energy and/or environmental performance was ignored. Others have reported instances of energy features actually being treated by appraisers as demerits to building value – for example, claiming that new building owners might consider solar panels unsightly or difficult to maintain.

This kind of the exchange value consideration is difficult to ignore for residential or commercial building owners in a capitalist property market, regardless of the importance of the environmental use value that may be added. In the US context, home value, in the form of home equity, is centrally bound up in many peoples' basic financial security (a security that the ongoing fallout from the subprime crisis continues to threaten): homeowners may only have a certain amount of economic freedom to take on more or less costly building or remodeling projects that do not add to or that take away from home value. This constraint is particularly important if upfront prices for these buildings are elevated or if retrofits are relatively large and costly. Building owners will have to figure in these extra costs into financing, without any certainty that underwriters will recognize these costs as actually adding to home value. If they sold the property before these features were paid off, they might still have to pay for them without the ability to count them in in the sale price.

To better understand this kind of valuation challenge, we must examine the specific structures by which US real estate is produced and reproduced as a commodity. As the next section will discuss, real property market structures vary by geographic context, because they are deeply embedded in the legal and regulatory structures of territorial states. As theoretical accounts like Polanyi (2001 [1944]) argue, land resists commodification: he calls it a fictitious commodity. Part of that designation refers to the problems confronting attempts to reorganize natural systems according to human logics in a way that sustains ecological functioning. The other part deals with the amount of work it takes to both make and maintain property markets, considering the ways in which social practices challenge simple market operation. We can see this difficulty historically in the amount of labor – of surveying, property law development over time, and so forth – that it took to establish modern property markets, even in a country like the United States where capitalist property markets operated virtually from first European colonization. And we can see it in the ongoing work of maintaining elaborate property law structures, whose continuing tensions have erupted in things like ongoing battles around eminent domain seizures.

The continuing complex status of real property and real estate markets manifests in the oddities of value determination. In an academic setting, these conflicts have played out in arguments over urban land rents. Marxist accounts have criticized Chicago School of Sociology theorizations for naturalizing capitalist land markets and historically

contingent structurings of urban space (see Walker, 1981). The kinds of built environment life cycle analysis considerations discussed in the last chapter may add new dimensions to this theorization. LCA might produce change if the energy and environmental costs of the urbanization process itself were economically internalized, investors were less free to abandon existing landscapes, and developers instead founded profits – e.g., from energy efficiency as a resource – on redeveloping and conserving existing built environments.⁵

Unpacking Real Estate Appraisal

Of more immediate concern is the way that these complex value determinations and problems play out in actual US real estate appraisal practices and market operation. I take up here a theoretical line on the sociology of existing markets developed by scholars including Callon (1998), Lohmann (2005, 2009), and Mackenzie (2006, 2009). Academics like Richard Ely were critical in founding some of the principles of real estate appraisal as a body of practice, an early history that Weiss (1989a, 1989b), Loeb (2001) Ramsey (2004), and Freund (2010) discuss. Before real estate practitioners joined with community developers in the mid-twentieth century, they based much of their bid for status as a profession on an ability to “scientifically” determine real estate value – distancing themselves from an earlier reputation tarnished by involvement with real estate speculation (Simultaneously, they created the structures of “creditworthiness” determination that would perpetrate federal government-supported racial redlining.) However, many commentators have emphasized that although this language of scientific, rationalist appraisal may persist in textbooks – or, potentially, be codified in new automated valuation models (AVMs) (Banton, 2002; Mooya, 2011) – that actual practice on the ground appraisal has long been an “art” as much as a science, one requiring a practical, intuitive sense of a market that appraisers utilized to guide decisions.

Nevertheless, appraisers, as they have come to be organized today, operate according to certain basic structures. Important international institutions in setting real estate value appraisal standards today include the Appraisal Institute, the Royal Institute of Chartered Surveyors (RICS), and the Vancouver Valuation Accord. Appraisers typically pursue one of two explicit methods of real estate appraisal. Hedonic value appraisal techniques involve separately enumerating and totaling up the features of a property including both building attributes – “improvements” – and the value of the underlying land. In contrast, comparative methods examine what similar structures within some defined geographic proximity sold for (providing part of the motive behind real estate players’ work to “create” new named urban neighborhoods in gentrifying urban areas). See Appraisal Institute (2001) and Brueggeman and Fisher (2008) for more technical explication of these methods. The comparative process is key in constructing real estate bubbles (and busts). With the primary basis of value established as willingness and ability to pay for a specific kind of property in a specific kind of place, there is no necessary upward ceiling or defined floor to real estate prices and rents. Thus, they are liable to speculative bidding up and herd effects.⁶ These blow-ups of property value can happen at various scales and following different kinds of geographies, from the US’s national US bubble of the 2000s (itself an aggregation rising home values in specific parts of different cities) to the more restricted price run-ups that often sweep downtown commercial property.

Appraisers are more likely to use hedonic methods for commercial properties. However, in reality, both are typically used. For example, evaluating land value remains a locational question for urban properties. Determining how much value to accord to any specific feature in a hedonic appraisal, or which features hedonic analyses even “see,” are also socially constructed choices. And decisions of what constitutes “like” properties to compare requires picking out specific building features for attention. These kinds of complex determinations, as well as decisions of what prices/rents a specific property market will bear at particular times – very different in the blowing up of a property bubble from the aftermath of a bust – begin to reveal how demanding these determinations can be, and how potentially arbitrary.

It is partially because of this complexity that property appraisal was for decades such a localized and urban market-specific service. Developing the detailed knowledge and intuitive instincts about a place required experience, and experience with only limited transferability and value elsewhere. Interest in specific kinds of features can vary considerably by clientele (e.g., type of business and position within a business field), class, and class fraction. And, given Bourdieu-style points about the relative arbitrariness of any class fraction’s specific taste preferences (as well as the changes and the relative rate of change in these preferences over time), any one real estate market might display unique kinds of valuation. Geographic unification and differentiation of these taste preferences might vary at a range of scales, across and between different cities (even cities in different countries, as we might see from the similar design of luxury beachfront condos across countries and hemispheres) to micro-patterning across different neighborhoods in a city.

Given these complexities in real estate appraisal, we can better understand why the market valuation of green and energy-efficient properties has posed such a problem. Builders complained that appraisers were not educated enough about the potential value of energy and environmental features to include them as part of the features used in developing hedonic value appraisals, or in coming up with property “comparables” (ACEEE, 2012). Nor might realtors list them among the features they use to advertise properties in one-sheets or on walkthroughs. Legislative advocacy like the SAVE Act (introduced in the US Senate in June 2013) is trying to change these structures. Proponents have suggested that making green buildings comparable against each other – a specific niche within broader real estate markets – might better represent the potential market for them. They have had some recent successes at the federal level (EERE, 2011). However, commentators have observed that even sympathetic and in-the-know appraisers and realtors prepared to represent, add value for, and market green features could not guarantee a local market for these properties – perhaps ideologically unwelcoming, or perhaps hindered by unwillingness or inability to pay for these features. And commentators have noted that potential markets without sufficient numbers of green buildings to serve as comparables could still run into valuation problems.

Green Value-Finding Exercises

Confronting this problem, green building advocates began in the 1990s to develop a series of value arguments that attempted to demonstrate reasons that building consumers should be willing to pay more for green building. In these attempts, they confronted a similar problem to broader environmental advocates in a neoliberal age: as environmental

regulation was increasingly pervaded by market logics, making cases for pro-environmental action increasingly required demonstrating quantifiable benefits. As discussed in the case of ecosystem services, these exchange value-finding attempts could rest on attempts to quantify previously qualitative, intangible considerations like aesthetic appreciation. They could also involve more dramatic changes to resource extraction systems or to “internalize” the value that natural systems contributed to preventing natural or anthropogenic harm to humans (e.g., the value of wetlands as flood control features and natural filters of nutrient pollution from agricultural runoff).

If the theory of comprehensive, total ecosystem services valuation (e.g., as expressed in the Millennium Ecosystem Assessment, 2005 or Costanza, 1997, which develop comprehensive global numbers) was followed to its logical conclusion for green buildings, it would require tallying up each LEED-certified building’s unique combination of green features – sustainably sourced wood products, water conserved via high-efficiency fixtures, public transit accessibility or improved bike infrastructure, improvement of indoor air quality and occupant health via elimination of toxic-offgassing carpets, etc. – figuring out the market value of each, summing this added value, and then adding it to the value of the building. (Actually, variation on the hedonic appraisal technique.) Given the complexities involved in any one of these calculations, it is perhaps not surprising that even the most diehard green building market advocates have not yet taken on this kind of conceptually difficult and quantitatively demanding project.

What many “business case for green building” advocates have done instead is to focus on public relations benefits or internal business improvements from pro-environmental action. Green building market proponents have often relied upon relatively anecdotal claims and qualitative justifications – that, for example, green office space might command higher rents or lower vacancy rates because its tenants are more comfortable, healthier, and derive satisfaction from these spaces’ contribution to a broader social vision. More serious attempts to realize these claims resembled ecosystem services enumeration schemes in attempting to convert relatively qualitative and intangible results to hard numbers. They focused on how green buildings could promote brand image, corporate culture, and employee recruiting and retention, potentially but not necessarily as part of broader pro-environmental programs. Related work focused on the connection between environmental quality and human health. These attempts took advantage of green building certifications’ broad focus, which can potentially encompass a range of features that can improve interior air quality and reduce the use of toxic substances. Surveys attempted to link the design inclusion of these features to reduced employee illness and sick leave time.

In an overlapping but distinct way, new value from energy efficiency as a resource can also be attached to real property. As discussed, players typically frame the economic benefits of energy-focused improvements according to the specific stream of utility cost savings that they are expected to bring in over time. However, other proponents discuss the simultaneous value that these improvements might convey in real estate markets. Advocates argue that because property owners can expect high energy performance buildings to reduce their energy consumption, and consequently their energy utility bills, that these buildings are a superior product. Assuming that a new or retrofitted energy-efficient building physically deteriorates thereafter at a relatively slow rate, these features/improvements can be converted into a steady stream of energy savings that may

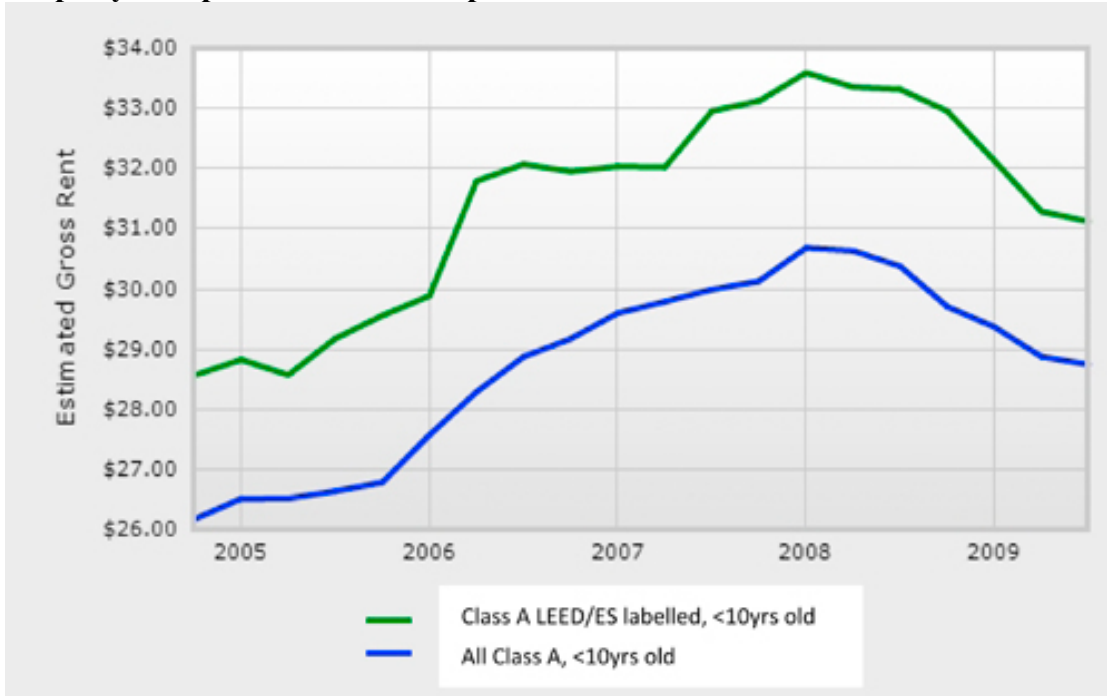
to contribute to property value well after the initial investment in them (either in an extra price paid upfront or in money paid to retrofit them) is paid off.

More energy-focused advocates have an advantage over broader green building interests in that energy has an existing market: they can cite energy prices to justify added value for energy efficiency. And they may use projected energy price trends to justify long-term value added. Building energy investments might have more value in the future if energy prices go up, either because of secular changes (e.g., increased worldwide demand for finite fossil fuel resources) or because market climate change policy or other energy and environmental regulation may increase energy prices. Some advocates include this kind of logic with speculation about more stringent future energy and environmental building codes, arguing that acting ahead of the market might save building owners money. As I will discuss in the next chapter, that “regulatory” market value is of course dependent upon governmental willpower, the effectiveness of market-regulatory schemes, and the ability to bound markets in such a way as to prevent meaningful leakage.

However, although these qualitative justifications for why consumers should be willing to pay more for green or energy efficient buildings may be necessary for the creation of new markets, they are not sufficient. For one thing, actually existing real estate markets do not of course operate according to what people “should be” willing to pay: market-based environmentalism requires voluntary buy-in. Meanwhile, real estate developers and financiers have demanded large-scale, quantitative “proof” of demand to justify financing major interventions in existing property markets.⁷ It is precisely this kind of transformation in statistical information provision that has been such an important spur to and outcome of today’s green building boom.

In the late 2000s and early 2010s, a wave of large-scale statistical research investigated how buildings green and energy efficiency certified buildings perform in US real estate markets. This work statistically compares large-*n* samples of properties both nationally and in different US real estate markets. See, for example, Kats (2003) (an antecedent to the current work), Eicholtz et al. (2009, 2010), McAllister (2009), McAllister and Fuerst (2009), Muldavin (2010), Bardhan and Kroll (2011), and Kok et al. (2011). This endeavor was itself enabled by the recent dramatic increases in numbers of buildings certified green and energy-efficient – this kind of large quantitative analysis required a statistically significant sample of green buildings, previously impossible in the many US real estate markets that had claimed only a few certified properties. Critically, these studies have largely found that in the United States as a whole and in many commercial office markets, a value premium existed for certified-green and energy efficient property: a reliable and numerically significant market value over and above that of otherwise-comparable conventional buildings.

Figure 2
The Green Premium: Average Rent per Square Foot for LEED or Energy Star Property Compared to Peer Group



(Data Source: CoStar) Figure Source: Fuerst, F. (2009) “Building momentum: An analysis of investment trends in LEED and Energy Star-certified properties,” *Journal of Retail and Leisure Property*

This shift to rapid large statistical market-making in the US has important recent history in the subprime bubble. Many real estate players in the 2000s attempted to displace received wisdom about the “art” of real estate appraisal and its geographic specificity, instead promoting large statistical modeling techniques, often via revolutions in spatial data analysis tools such as geographic information systems (GIS). They attempted to automate appraisal (see Banton (2002) and Mooya (2011) for discussions.). They also worked via sites like Zillow to make approximate real estate values more openly and easily available. These trends also bear comparison with the increasing proliferation of automated financial models in investment (Callon, 1998 and Mackenzie, 2006). Although more research is needed on potential connections between these trends, they raise similar issues – for example, the potential for these numbers to create false certainty, a veneer over a messier reality. In addition, in both cases the new tools may make it easier and faster to create markets and exploit investment opportunities – or to blow up bubbles. The experimental use of geospatial valuation tools in appraisal has been itself bound up in the globalization of real estate, moves to make real estate investment an increasingly global practice.

Uneven Geographies of Greening

The aggregate numbers reported above conceal considerable variability in actually existing real estate markets. The landscapes that previous rounds of real estate

speculation produced in the United States weigh heavily on current greening attempts. Financialization produced its own uneven geography through, for example, the neoliberal centralization of the US financial system, regional disinvestment, and successive real estate and financial bubbles in places like San Francisco. In addition to helping fuel 2000s exurban development and gentrification in the neoliberal era, this economic history has produced increasing insecurity in household wealth and real property ownership, notably in disinvested US regions like the Rustbelt and in inner cities. These trends and geographies will continue to shape the prospects for energy efficiency transformations, and what this green economic development actually means in terms of racial and economic justice, real economic development, and sustainability.

The fall of many regional banks and savings and loans post that repeal of the Glass-Steagall Act and related New Deal-Keynesian banking legislation meant the increasing consolidation of the financial industry geographically as well as organizationally, with New York in the lead. This reorganization meant that the surplus of many places was increasingly transmitted out-of-region to these financial centers. For cities that were recipients of this redistributed national wealth, this incoming surplus helped boost their commercial downtowns, downtown commercial and residential real estate, and general economies (including “post-industrial” and “creative class” functions, as critical scholars of these formulations have argued; e.g., Peck, 2005). It helped fuel gentrification and commercial real estate booms and bubbles in these favored locations for investment. And the urban economic base derived in this way has allowed real estate markets like New York’s to function as targets of broader global investment. Conversely, this financial geography furthered the disinvestment of regions like the Rust Belt. The financial system’s concentration of economic surplus in financial centers has thus produced urban economies dependent in important ways on accumulation by dispossession rather than more “virtuous” innovation-based accumulation.

The real estate-financial bubbles that marked the neoliberal era deepened this uneven geography. Different bubbles during this period had distinct geographical characters. Some waves of real estate speculation focused largely on financial centers, other booming cities, and commercial real estate. Their impacts on non-elites came mostly in the form of gentrification and more indirect economic effects – although we should recognize that with the rise of massive institutional investors, increasing amounts of the wealth that fueled them belonged to working class investors. In contrast, the subprime bubble more directly dispossessed working class borrowers of their household wealth and creditworthiness. Analyses of the subprime bubble’s geography have framed it as a direct transfer of wealth from working class regions and populations to financial centers, and particularly to elite financial industry players like Goldman Sachs who pulled out ahead of the collapse, “shorting” the market.

In the aftermath of the subprime collapse, ongoing foreclosures decimated the real wealth of both economically insecure borrowers taken in by predatory subprime loans and a broader swathe of middle class borrowers forced to the outer exurbs of the metropolitan Bay Area and other hotspots (e.g., Bardhan and Walker, 2011). New developments have also included moves by large investors to buy up foreclosed homes and commercial buildings on a very large scale and convert them to rental property. This trend raises the specter of future large-scale gentrification, in hotter property markets,

and/or a more secular change in the possibility of working or middle class homeownership.

The uneven condition and recovery of property markets post-subprime collapse has structured a likewise uneven actually existing geography of energy retrofits and green building (particularly once the redistributive influence of federal stimulus programs is taken out). The wave of green retrofits and conversions, while significant on a national level, has been concentrated among specific property types, and has in important ways been restricted to a few key “creditworthy” US office markets like the San Francisco: i.e., cities particularly successful in this latest round of inter-urban competition for investment, and successful at green because they have been successful in other ways first. Analyzing the greening of commercial real estate and its geography, Bardhan and Kroll (2011) found that both Energy Star and LEED certifications followed the urban wealth – making for a highly uneven pattern in a time of widespread but geographically variable economic crisis and ongoing hardship.

Analyzing factors potentially influencing greening, they found that the share of Energy Star-labeled square footage correlated most strongly with per capita GDP in the metropolitan area. For LEED-rated buildings, the strongest correlation was asking rents (a proxy for the strength of the metropolitan office market). And they confirmed that as emphasized by market analyses like DBCCA (2010), Urban Land Institute (2010), ACEEE (2012), and PriceWaterhouseCoopers LLC and Urban Land Institute (2013), Energy Star and LEED buildings were also more likely to be taller, newer, and higher grade commercial space (Class A or B). Other patterns have secondary importance – e.g., Energy Star share is higher on the west coast and in places with extreme climates. Ironically, this often means cities like Houston and Dallas-Fort Worth whose wealth is highly tied up with fossil energy production, including the current unconventional extraction boom (see Jones Lang LaSalle, 2011, 2012).

The Bay Area, and similar cities like New York, Los Angeles, Portland, and Seattle, are leading regions in the wave of new green building activity. The Bay Area encompasses some of the most prominent actors and projects in green commercial retrofits and conversions, including a host of experimental financing instruments and start-ups, cleantech ventures, and big financial underwriters. Like many other green activity centers, it is also a place where populations on the leading edge of US accumulation and some of the most excluded tensely coexist. In places like Oakland in the Bay Area, the finance-mediated dispossessions of the subprime bubble have cleared land for massive land tenure shifts, evacuating working class and historical minority populations and preparing the ground for what many anticipate will be a wave of large-scale gentrification, perhaps “green gentrification.” Meanwhile, many other places’ history of financialized accumulation by dispossession has blocked the mass rollout of green building programs today. A regionalized “creditworthiness” problem now afflicts whole urban real estate markets as well as prospective property owners within them (ACEEE, 2012). In places like the Rust Belt, while working class populations have suffered disproportionately, capital abandonment borders on absolute, with long-term depopulation and large-scale structural demolition looming – problems potentially too structural for the kinds of green economic interventions presented here to solve.

These patterns are a far cry from the mass landscape changes demanded by energy conservation and climate change mitigation visions. Contrary to the hopes of

weatherization advocates, for many people extra property value from a green premium or energy efficiency as a resource has not so far been enough to do much against that underlying instability. Many property owners and investors in economically struggling places have been unwilling or unable to take a chance on greening. More speculatively, critiques might ask whether these patterns indicate more generalized regional financial exclusion – is blocking whole markets for lack of “creditworthiness” a new kind of “green” redlining? This kind of exclusion is a major potential threat to the resilience of these regions, particularly if, as expected, energy prices experience large secular increases in the twenty-first century. Finally, critical analysis must consider these existing and recent historical geographies of financial speculation in interpreting what current energy and environmental real estate investment may mean, particularly the ways in which it risks replicating this kind of geographic (and raced and classed) accumulation by dispossession – or, perhaps, serve as fodder for more geographically restricted forms of commercial real estate speculation.

Finance and the Green Premium

Many FIRE (finance, insurance, real estate) sector actors have used initial evidence of this potential green premium to alter their accumulation strategies vis-à-vis real estate. Their strategies have ranged from calculative changes designed to recognize/reify the possibility of a green premium to financial instruments that attempt to harness this value to drive accumulation. These instruments have joined PACE and other new financing schemes directed more closely at energy efficiency as a resource in advancing a broader green finance sector. This wave of financial experimentation partially builds on the language of a “financing gap” outlined previously, the creation of a new need for financial instrument development and for financial expertise. And it is a source of rising speculative interest. Just as generally rising real estate market values through much of the 2000s increased the assessed value of individual properties, analysts hypothesize that future general market movements will increase the size of the priced energy savings potentially derived from high energy-performance properties. Major global players in the commercial real estate sphere include, among realtors and property managers, CBRE Group, Inc., Jones Lang LaSalle – and a US green real estate specialist, Malachite LLC. And they include a growing set of financial players (Bostonia Partners, LLC, Cascadia Capital, LLC, Class Green Capital Partners, LLC, Clean Fund LLC, Dominion Federal, FMI Capital Advisors, Inc., Green Campus Partners, LLC, Guggenheim Capital Markets, LLC, Hannon Armstrong Capital, LLC, Metrus Energy, Inc., Skyline Innovations, Transcend Equity Development Corporation, and United Financial of Illinois, Inc.).

Real estate and financial players taking note of these findings have included but are not limited to RREEF (2007, 2008, 2010), Deutsche Bank Climate Change Advisors (DBCCA) (2008, 2010), Urban Land Institute (2010), DBCCA and The Rockefeller Foundation (2012), PriceWaterhouseCoopers LLC and Urban Land Institute (2013). Deutsche Bank Climate Change Advisors (DBCCA) (2010) exemplifies the financial perspective on these climate change investments, the search for “alpha” opportunities from these new markets and the pursuit of various accumulation strategies for different classes of finance capital: institutional investors including pension funds, insurance

companies, private wealth management for the rich, endowments or foundation investors, and so forth. These actors are interested in the new speculative and longer-term investment possibilities of green and high energy performance building in the United States.

Financial actors are also stepping in to propose new financial instruments and investment vehicles that aim to harness this green price or rent increment for accumulation. Important vehicles include new and rejuvenated Energy Efficiency Mortgages, other green mortgages, and green real estate investment trusts (REITs). As we will see, these instruments overlap in important ways with the PACE-style vehicles discussed above; Chapter 8 will discuss a related set of instruments being developed more specifically for employment by urban redevelopment agencies and other fiscal agencies. Similar to energy efficiency as a resource instruments, these schemes commonly work on the expectation of future streams of value from green and energy-certified property. These include extra rents that they expect to grow over the long term with changed norms for property, increasing energy prices, and tightening environmental regulation.

In addition, these instruments are often being directed with energy efficiency as a resource-directed tools into related secondary markets. These structures provide ways for investors to abstract new energy and environmental value from the concrete material conditions of its production – in this case, from an investor's collected real estate holdings – draw the green performance aspect of this property into commensuration with properties in potentially different local markets, bundle these properties, and watch them perform as a hybrid commodity. These traded commodities present a financial architecture that allows energy and emissions savings derived from concrete changes made in-place to be abstracted and conceptually transported across real estate markets, geographical boundaries, and even sectoral divisions, abstract commensuration that produces global commodity prices (Lohmann, 2009).

However, as proven in the subprime bubble, real estate investors have already devised financial instruments capable of overcoming real property's ostensibly irreducibly locally embedded valuation and fixed, non-tradable nature. Researchers including Weber (2002, 2010), Fox-Gotham (2006), Christophers (2009), Brenner (2009), Ashton et al. (2012), and others argue that the development of mortgage-based derivatives and other financial products increased the penetration of finance in the built environment to an unprecedented degree, allowing land to function increasingly as a financial asset – a contention originally debated by urban geographers in the 1970s and 1980s (e.g., Walker, 1974; Harvey, 1982).⁸

New waves of real property speculation have been made possible in part by the broader development of new financial instruments for real estate investment. These instruments have expanded beyond more traditional, direct forms like limited partnerships and limited liability corporations. While US commercial property investors in the 1980s developed a speculative logic that hinged around real estate syndications and a specific depreciation allowance in Reagan-era tax code amendments, along with speculative rent build-ups cities like New York and London (Downs, 1985; Fainstein, 2001), investors more durably took up REITs as an instrument. Created by the US Congress in the early 1960s but taking off widely in the mid-1990s, these trusts work by establishing a portfolio dominated by real estate assets, individual properties owned

outright, leased, or held in the form of purchase options and mortgages. Individual REITs are then generally traded on stock exchanges, although they can also be structured as private (non-traded) vehicles and owned by hedge funds or private equity funds (McCann and Gross, 2012; Shachter, 2012). These securitized vehicles give financial actors (in theory including more modest investors) an opportunity to invest in property shares without having to bother with the complex particularities of understanding and profitably managing geographically disparate pieces of real property (Edelstein et al., 2011). The logics of these diversified asset portfolios work like those of funds more generally, with individual properties as the assets. And REITs themselves become assets in funds. REITs plummeted in the aftermath of the Asian Financial Crisis but have been taken up in a new wave of contemporary interest. REITs have been utilized primarily to invest in income-producing commercial property, each typically specializing in office buildings, apartments, retail spaces, or another specific property type.⁹ However, their use has also been extended to or is being considered for a broader range of land, resource, and infrastructure types: timberland, farmland (HighQuest Partners, 2010), and renewable energy infrastructure (Rampton, 2012).¹⁰ And these emerging land and resource-based REITs can harness new green value logics. For example, the US Internal Revenue Service recently approved timber REITs' request to treat their tradable carbon emissions units as an income-producing asset (Schneider, 2011).

REITs require enabling national legislation to enact, and only certain countries allow them. But those permitted territories are expanding; e.g., see Fox-Gotham (2006) and Christophers (2010). The European and Asian equivalents, publicly listed real estate companies, are also originating globally listed real estate securities. (This model warrants more analysis.) Considering both, Edelstein et al. (2011) claim that increasing global integration of financial markets helped drive rapidly expanding market capitalization: from \$128 billion in 1990 to \$936 billion in May 2007. Legal geographies can also shape functional expansion within countries. For example, REITs in the United States typically require enabling legislation to extend into new real property sectors – with farmland REITs, solar and other renewable energy REITs await governmental approval (Rampton, 2012). We may gain further insights into ongoing questions about the financial asset status of land, and further appreciation of the structural role that legal geographies play, by looking further at tax codes – the growing number of international investors who now hold real property assets on their portfolios are similarly concerned with how these institutional “country factors” shape their returns – especially with the increasing expansion of world real estate markets to include property in developing countries (Edelstein et al., 2011). In the United States, for example, many real estate financiers frame their strategies around the ability to classify real property earnings as financial earnings – thus falling under relatively favorable neoliberal-era capital gains tax treatment. A key factor driving REIT expansion is their specific tax logic – they have been structured as a way to help domestic and foreign investors lower their taxes and to themselves avoid higher corporate tax in favor of capital gains rates (McCann and Gross, 2012; Schachter, 2012).

And REITs make up just one instrument in a host of new financial instruments meant to spur investment into real property assets and funnel increasing capital flows in and through urban landscapes. As discussed earlier, residential MBSs centrally facilitated 2000s era investment into subprime mortgages (although they have a longer history via

US public-private real estate corporations, Fannie Mae and Freddie Mac). As is now widely known, central to subprime mortgage origination and trading were processes by which financial players 1) aggregated funding streams from distinct properties, 2) classified them according to specific aspects of their value (in the case of subprime loans, tranches distinguished by more or less pronounced risk of non-repayment), 3) repackaged these combinations as mortgage-backed securities (misclassified as “safe,” investment-grade financial products), and 4) set these now-abstract value streams free to travel far enough that potential buyers were generally unaware of the concrete conditions of their origin, including predatory lending practices (e.g., Brenner, 2009). Subtracting the subprime-specific items in parentheses, this sequence is disconcertingly similar to proposed secondary markets for aggregated green/energy-efficient property, or financial instruments meant to be backed by the stream of value from these aggregated properties.

These assets harnessed a value stream another step back from direct property. With MBSs held as financial assets, creditors are drawing primarily on the stream of payments made to them by mortgage holders. More indirectly but critically, however, these instruments also depend on the assets underlying these mortgages: if this real property loses enough value, mortgages will be underwater and risk non-payment. Although finance may in this eventuality foreclose on these properties, as we have seen in the long aftermath of the 2008 collapse this option only works if this value loss is isolated rather than general – investors may find themselves in the position of holding large amounts of properties for years, either placing long-term bets on land and real estate value recovery or writing down the value of these assets. Despite these real problems, neoliberal-era proliferation of vehicles for real property investment was unprecedented; it will continue to influence financial actors’ land and real estate investment strategies (e.g., Sassen, 2009).

Investors in green property work within this financialized structure and are taking up its instruments. For example, the Global Real Estate Sustainability Benchmark (GRESB) Survey now surveys publicly traded REITs and funds run by large private real estate companies for investment in sustainable properties. Major institutional investors may use the tool to target green portfolio investment, for socially responsible investment mandates but also to speculate in the value of green property. In 2005, the National Association of Real Estate Trusts (NAREIT), the association that represents US REITs, initiated a less thoroughgoing program to recognize superior energy performance, its Leader in the Light award. Since 2012-2013, NAREIT has worked more closely with GRESB to track and recognize sustainable investment.¹¹ The USGBC also entered the field in 2013. It partnered with NAREIT and FTSE Group, a subsidiary of the London Stock Exchange that provides stock indices, to create a green property index, FTSE NAREIT USGBC. With this index, the USGBC aims to go beyond the industry’s preexisting reliance on voluntary disclosures. It will independently score a set of REITs commonly used as a benchmark for US real estate for their green investment, measured as the relative value of their real estate portfolio that has been LEED certified or received an Energy Star label.¹² The last few years has also seen the creation of real estate investment funds that specifically target green properties, instruments that make direct bets on these buildings increasing in value.¹³

Although more directly linked to energy efficiency retrofits, secondary markets like greenhouse gas emissions trading or energy efficiency certificates may supplement

this green premium, given that buildings may be multiply registered with LEED and with more specific energy certifications like Energy Star, and may be undertaking additional energy activities on top of this certification. For example, some industry players have advocated expressing energy savings from retrofitted large commercial buildings or aggregated smaller structures in greenhouse gas emissions-equivalents, then trading these emissions savings in carbon markets – e.g., Pacific Carbon Exchange (2010), which has lobbied for real estate inclusion in California's AB 32 greenhouse gas emissions trading scheme. Others have hypothesized that buildings might be linked to previously discussed markets for tradable energy efficiency certificates and credits (Vine and Hamrin, 2008).

Finally, the strength and priorities of finance have been critically important in shaping the geographic patterning of green markets so far – which places and sectors, as well as which specific buildings, are being taken up in value appreciation schemes, and which are not. Despite revelations of their malfeasance in financial and real estate bubble throughout the neoliberal era, financial institutions retain the power to determine what places and sectors of investment are “creditworthy.” Of course, this determination has much to do with how places have recovered economically – or not – from the financial collapse, and the related but distinct issue of how their property markets fared in the recession. For some financial institutions, it is more directly enforced by regulations controlling what funds like pension funds can invest in, financing rating-wise (ACEEE, 2012). It is telling that the financial industry can bolster and rebuild its position of power and expert position in response to a crisis it was instrumental in causing.

Contradictions and Points of Failure

The task of determining a green value premium presents challenges that raise significant concerns about the financial infrastructure and policies being organized around it. The last two chapters discussed important problems that potentially compromise energy efficiency as a resource schemes – both energy retrofits and green information technology's bids for behavioral transformation. Given the overlap between energy efficiency markets and more general green property markets, we must think about how these failures translate into compromised green premiums – or, significantly, fail to translate.

Manufacturing Economic Obsolescence

More fully understanding the way that new proposed green resources can break down, both in a use value and exchange value sense, requires further considering geographical political economy, the laws of motion that operate in the creation and creative destruction of cities. One such driving force is economic obsolescence. Previous chapters discussed how building deterioration due to processes like weathering helps make buildings less efficient over time. Physical obsolescence manifests in things like the loosening of building seals over time and increasing inefficiency as physical plant technologies reach the end of their useful life. The “natural” lifespans of these things are expressed in qualitative estimates like Brand's (1995) “shearing layers,” which estimate lifetimes for different structural components of a building. Of course, “natural” lifespans are anything but. Average building lifetime varies widely depending on the initial quality of

construction, and it also depends upon how well that building is maintained. Public and private institutions economically encode these processes in the form of value depreciation timelines. This process adds another layer of social construction, since depreciation trajectories are average figures that bear only a loose resemblance to the material breakdown of any particular building. Moreover, these abstractions do real work: the rate of depreciation selected matters. Foreshortened formal lifetimes for buildings and building components can mean foreshortened lifetimes in practice. In other words, accelerated economic depreciation can provoke premature abandonment of viable buildings.

Manufactured *economic* obsolescence is therefore a major concern for attempts to create sustainable urban landscapes. Lemer (1996), Appraisal Institute (2001), and Brueggeman and Fisher (2008) identify material versus economic depreciation as loosely related but not identical things. In several key historical schemes, real estate and financial interests have manipulated the economic rate of depreciation for certain US property types, to major economic effect. For example, Jackson (1985) describes how the federal government has used the rate for single-family home depreciation as part of long-term tax subsidies to single-family homeownership. Downs (1985), Hanchett (1996), and Fainstein (2001) examine how real estate players deployed accelerated economic depreciation as a lucrative tax shelter for investors – fueling suburban shopping center construction in the 1960s (Hanchett) and driving the syndication boom that was critical to the late 1980s commercial property bubble in New York and Los Angeles (Downs, Fainstein). The manipulation of economic depreciation rates can also provide tools for speeding up financial speculation in other ways, notably for downtown commercial real estate (Yablon, 2004). Speaking to an early twentieth century boom period in skyscrapers, Yablon exemplifies the kind of logic at work:

The period 1893 to 1918, retrospectively characterized by recent economists as a single cycle in the building economy, was in fact experienced as a succession of sharp and unpredictable fluctuations and oscillations: a series of mini-cycles lasting not twenty or thirty years, but two or three. And with each cycle, the life span of the skyscraper appeared to grow shorter. If an injection of capital into the built landscape had been necessary to kick-start the engine of capital accumulation, now only by opening the throttle – in other words, by increasing the rate of demolition and reconstruction – could the engine be kept running. New tax laws would confirm and abet this process by recognizing tall office buildings as ‘wasting assets’ prone to rapid ‘economic depreciation,’ and consequently providing ‘subsidies, tax breaks and other official inducements’ to build and rebuild. Thus lubricated with the oil of credit, subsidies, and tax breaks, the skyscraper appeared to function as a vital but unstable component in a larger economy of planned obsolescence – a pursuit...of ‘perpetual motion’ (Yablon, 2004, p. 317).

In the current moment, real estate industry players are invoking defensive framings of economic obsolescence of green and non-green building. They argue that the current wave of interest in green possibilities will over the relatively short term threaten the value of non-green buildings. For property owners who fail to take up the opportunity of green building or retrofitting, their properties might become economically obsolescent, losing much of their exchange value. Discussions of very different political valences in Weber (2002) and Jones Lang LaSalle (2013) on obsolescence highlight the critical role that manufactured economic obsolescence is playing in the construction and destruction of landscapes today. These kinds of logics are increasingly being encoded in the financial

structures that shape real property value. For example, Firemen's Insurance is developing insurance appraisals that cover the replacement value of green features added to a building. These framings of increasingly rapid economic obsolescence suggest economic possibilities but in a landscape of more pervasive and sped-up geographical creative destruction – not strong conditions for sustaining urban landscapes over the long term.

Ecosystems of Property Value

Another problem lies in the complexities of urban real estate markets. As Harvey (1982), Logan and Molotch (2007 [1987]), and other authors have pointed out, urban land values are subject to complicated spatial ecologies. Even if green is valued, seismic shifts in a location's value due to many factors may dwarf a potential green premium. These complex factors include the local particularities of buildings, stubborn assertions of use value over exchange value in a deeply personal and meaning-laden sphere of social reproduction; neighborhood value effects; and unpredictable and non-linear value transformations. Rapid appreciations or depreciations in land and property value can come from the spatial shifting of urban growth paths, entitlements, and jurisdictional reworkings. Temporal dynamics – cyclical and secular changes in land valuation – interact with these local geographies to create a complicated value environment. As discussed, real estate appraisal has long been a qualitative and intuitive practice that relies heavily on property comparisons and recent sales rather than hedonic, quantification-heavy approaches (e.g., Eicholtz et al., 2010).

Hedonic valuation models and their presumed ability to value particular characteristics of a building individually may work better for valuing green than models dependent on finding comparable property. In general, green valuation along these lines may work better in commercial real estate, where operators are more assimilated to the exchange and financial value of their properties (e.g., Christophers, 2009). However, commercial buildings remain embedded in the broader urban property market dynamics described. All these factors – local particularities of buildings, neighborhood effects, real estate market dynamics, and longer-term economic trends – suggest complexities that might prevent energy savings and green certification from translating into property values in a simple way. Moreover, these background value fluctuations might sufficiently dwarf those arising from a green premium as to minimize the latter element's power to direct the massive real estate transformation envisioned by advocates. Regardless, these intense fluctuations are not a recipe for sustainable pro-environmental action. And, as discussed in Chapter 3, they reflect a broader problem with the ways that capitalism's geographical creative destruction conflicts with long-term conservation of existing built landscapes.

A Breakdown in Effective Demand

Finally, a critical problem facing green building and the value of “green-ness” is the lack of sufficient *effective* demand. Geographic investment and disinvestment map onto broader regional prosperity and depression in the United States, and shape and delimit market demand for green buildings. These geographic fortunes will continue to shape the growth or inhibition of green building markets in the United States and elsewhere. These dynamics may exclude some places and people from greening due to lack of “creditworthiness.” This is especially likely to be a problem if (when) energy prices rise. Green buildings and cities may derive extra real estate premiums from that rise according

to the logic laid out here. However, places left out will have neither “modernized” real estate nor the resilience to environmental change that energy efficiency retrofits are meant to convey: a potential problem for both property values and human welfare.

Uneven and selective geographic uptake also raises a critical problem for real estate players and for governmental visions of the green economy. The prospect of a narrow segment of the US built environment and population taking up high energy performance and green construction practices and retrofitting existing structures for energy performance might work fine for the business models of some actors – for example, architects focusing on a specific economic, cultural, and geographic niche market. However, this partiality would pose significant problems for companies whose business model and ambitions rest on reaching a mass market. And it is particularly a problem for actors concerned with climate change mitigation, and for long-term bids to expand the economic potential of energy efficiency as a resource by linking it to greenhouse gas emissions pricing. As the next part of the dissertation will outline, climate change mitigation has been framed as subject to a geographic “prisoner’s dilemma” problem, within the US and globally. It is very difficult to come up with climate change regulation or commodification schemes that work in a geographically partial way, because climate change is a systemic problem that demands systemic response. Schemes to address climate change must control major shares of emissions to be effective or profitable. If green building only works in a few cities, it will not command enough emissions to be an effective solution.

Toward a Conclusion: How Do Performance Failures Manifest?

Forecasts of a green building boom must be evaluated in light of the deep-rooted realization problems that ultimately punctured the subprime bubble. Not only do ongoing effects of the subprime collapse continue to play out in real estate markets, economic problems, and fiscal troubles, but its deeper underlying causes – real US wage stagnation, widening income inequality and urban and interregional disinvestment – have been insufficiently addressed by green economic visions or other political economic changes. And if green building impels speculation it may heighten domestic inequalities and insecurities. To recover the very real energy and climate benefits possible through a transformed built environment, critically engaged academics must continue to explore these unfolding dynamics and find in them opportunities for more profound, ambitious, and just visions.

Performance failures are likely to have relatively rapid consequences for energy efficiency as a resource-focused proposals. These start-ups and government programs are under pressure to measure their success or failure in relatively straightforward quantitative metrics; i.e., energy saved or not saved. Although these totals may be subject to some manipulation via the choice of baseline energy consumption used or measurement and verification protocols used, this market is more straightforward than ecosystem services schemes or carbon offsets.

In contrast, performance problems are likely to have less direct – but ultimately potentially more profound – consequences for green premium-based real estate schemes. As discussed, these two kinds of strategies for deriving value from energy and

environmental transformation of (new and existing) built environments overlap to a considerable extent. However, as also discussed, the green premium is based as much upon perception, willingness to pay, and other nebulous factors as on the narrower but more tangible performance indicators of energy saved. This broader base is necessary considering that green-certified structures often promise environmental benefits in addition to energy conservation, ones that have not been valued or commodified. However, it also gives certifiers and adopters a greater degree of flexibility – some argue a problematic degree of flexibility – about proving that these certifications are operating as promised. Actually evaluating these schemes’ success in environmental harm averted is a tall order. Imprecision about what “greening” signifies in these exchange value and rent discussions indicates a problematic lack of knowledge on the part of the many of the real estate industry players involved. For example, we can see this relative ignorance in the way that statistical analyses like treat LEED and Energy Star-certified buildings as interchangeable. This treatment says nothing about these schemes’ essential differences, and critically their differing dependence on immediate, quantified performance.

A critical fear with green premium schemes is, therefore, that this lack of ability to test value generated may provide fuel for speculative bubbles and worse, that the actors most harmed by the consequences of these speculative bubbles may be consumers rather than financiers. We can see the potential danger here in instruments that leave consumers on the hook for contracted financing even if the promised energy cost savings or other green real estate value appreciations do not materialize. This kind of problem is reminiscent of the subprime crisis. In the generation of the crisis, complex financial instruments proposed to solve a key “financing gap,” the fundamental problem of economically insecure borrower taking on large home loans or refinancing – and, of course, failing to realize this effective demand and leaving the already financially strapped far worse off than before. The same root causes standing in the way of effective demand then persist now – except, again, worsened. (This is the kind of concern that Fannie Mae and Freddie Mac cited in their decision to block their clients from participation in residential PACE programs.)¹⁴

Chapter 6: New Resources, The State, and Finance

The actors driving these valuation and market creation processes reviewed in Part I were diverse. They ranged from the broad array of players who organize real estate development and construction to high tech boosters to energy utility companies.¹ The driving players who come up most consistently in this study are finance and the government, in their various forms. In this second part of the study, I consider the state-financial role and relationship more directly, asking how these players are variously trying to make use of these new kinds of resources and clashing with each other. I will argue that finance and major real estate developers have become driving players in urban greening in the United States, even as green collar jobs organizers won governmental support for more economically redistributive visions. Finance is helping transform green building and energy retrofitting from niche sectors into mainstream real estate and urban economic development practice. Simultaneously, financialization threatens to make green urbanism increasingly risky and exclusionary. These exclusions profoundly threaten national governments' visions of green manufacturing renaissance and, more broadly, their hopes for market climate change regulation.

Resource geographers have long been concerned with a national state role in resource extraction and procurement. They have examined state strategies for connecting resource booms to economic development, or maintaining other national states and territories as subordinate peripheries for primary resource extraction. These questions have animated postcolonial development trajectories and have been major points of political struggle since the dawn of industrialization. As resources have taken on unusual new forms in the current moment, they are animating new kinds of state strategies: to formally establish and protect the value of radically new and often fragile commodities, via various mechanisms; and to incubate high tech clusters and industrial transformations that might translate these new sources of valuation into breakthrough technological innovations. Given that the new resources in question sit within urban real estate markets, urban governments are also important players, above and beyond their parallel role as centers for generating new economic growth. Both national states and cities have had to deal with finance's own emerging visions for vis a vis the green economy, as finance both positions itself as a necessary ally for governmental efforts and undermines these governments' ability to undertake autonomous economic and environmental policy.

At the current moment, the relationship between powerful national governments and finance is in flux in important ways. Scholars of financial geography have considered state institutional differentiation and how that shapes finance-governmental relationships. New analyses must move beyond comparative statics to more explicit questions of *process*: how are financial institutions making use of states for specific accumulation strategies, how are they changing states in the process, how are different states or kinds of governmental entities shaping these transformations, etc. Those general kinds of questions lead to many more specific ones.

For example, the current discussion demands consideration of finance's dual role: as a powerful tool for opening up new realms of accumulation and one that territorial states correspondingly enlist, and simultaneously as a tool that financiers wield *against* states. The historical strategies of financial centers like London and New York, different

kinds of offshore centers, and the rise of sovereign wealth funds today begs the additional question of when we should think about financial and state interests as a unity, and particularly a unity or collaboration working against other states, state-financial systems, or “outside” territorial spaces. What financial activity, and geographies of financial activity, “count” as national is of course another live question, especially as taxation battles around offshoring have heated up, calculations show just how massive offshored pools of capital are, and discussions have been opened back up about how national balance of trade and payment accounts are calculated. Post-mortems of the financial crisis in the United States have demonstrated how these kinds of questions can translate from the level of sovereign states and national territories to sub-national spaces. US financial institutions and centers extracted wealth from other US regions and leveraged the federal system to create space for particular financial game-playing – for example, how institutions worked on particular states to pass enabling legislation that legalized financial instruments like interest-rate swaps in particular jurisdictions.

Beyond these general questions, the dynamics of the green economy demand more consideration of how states and financial institutions work together to create spaces where unconventional and difficult forms of resources and property “work.” Massive property law structures and their enforcement are required to keep even basic land within a territorial state like the US functioning as private property: the task becomes much more difficult when intangible commodities like financial instruments, intellectual property, and environmental regulation-backed commodities like ecosystem services move to the forefront of accumulation and have to be protected. The current political economic moment has seen the rise of both environmental regulatory commodities like traded carbon that only count as value within particular regulatory spaces, and investment products like swaps or real investment trusts (REITs) that have similarly uneven geographies shaped by particular geographies of enabling legislation and legal structuring (centrally including tax structures). Carbon trading regimes also have some interesting parallels with currency spaces and exchange rates, as they may similarly rework prices throughout entire economic spaces. Looking at campaigns to pass enabling legislation, overturn or work around established laws, or circumvent existing case law is a telling strategy for tracking the creation of new financial markets.

This analysis is especially important considering that certain fractions of finance are developing their own interest in the green economy and the investment potential of climate change more broadly, attempting to define new resources, make markets for them, and construct additional markets for financial instruments that harness this value. However, even as these “financial engineers” work with and rely on state programs, the broader relationship between finance and the state in the US threatens the state’s power to enact strong green economy policy. Decades of financialization have undermined the autonomy of even powerful states like the US and worked against more sweeping visions of green collar manufacturing employment. These trends that have worked against federal attempts to muster supportive political economic blocs behind green, coalitions that might challenge the income, employment numbers, and bases of regional political economic support claimed by conventional and unconventional oil and gas industries. Although the role of US hydraulic fracturing booms and other unconventional oil and gas finds has been an obvious problem for cleantech and green collar jobs visions and their

adherents in high tech regions like Silicon Valley, the structuring role that decades of neoliberal rollout and financialization has played has been much less examined.

A Green Spatio-Temporal Fix?

Geographical theory is useful in unpacking these complex dynamics, difficult for US economic development full stop and doubly complex considering the real novelty of what green economic development visions propose. For example, an important theorization of capitalist states' relationship to finance, and to programs for investment in opening up new frontiers for accumulation, is David Harvey's notion of a spatio-temporal fix. Harvey's (1982) (Lefebvre-influenced) theory of capital switching and the spatio-temporal fix presents a model of capital investment in producing space, particularly capital flight into real estate and longer-turnover infrastructure in times of turmoil in the productive economy. In *The New Imperialism*, Harvey (2003) restates the spatio-temporal fix via an account of historical long-term land and real estate investments. Briefly restating this often-referenced argument, he claims that crises of production that are sufficiently deep to present overaccumulated capital few attractive outlets for remunerative investment can prompt investors to sink it into infrastructure, industrial fixed capital, urban development, and other landscape-building investments in land and improved property that only bring a return over this longer term timeframe.

The past investment waves he presents paid out (at least partially) in the form of epochal industrial-organizational revolutions and the reproduction of capitalism at an expanded scale. Harvey particularly discusses US Keynesian investment during the country's long boom of the mid-twentieth century, the period of the New Deal and the US welfare state. Harvey's theorization adheres in some ways with the *longue durée* model of capitalist waves of accumulation and financialization proposed by Arrighi (2010). In addition, it provides another angle on the processes of geographic industrialization outlined by Storper and Walker (1989). Storper and Walker present a nonequilibrium theory characterized by strong competition; that is to say, a competitive dynamic led by production and the creation of surplus, shaped by booms and busts, and characterized by techno-organizational breaks and periods of super-profits (rents) for leading-edge corporations and economic regions. They contrast this argument with neoclassical economics, which posits equilibrium conditions as the norm and emphasizes "weak competition" around efficiencies in the use of resources and other factor inputs. They add more consideration of these technological and industrial dynamics to a theory of how capital (as an actor) and surplus capital investment shapes human and non-human geographies. They present a dynamic model of industrial location that, like Harvey, emphasizes the power of these economic players to make places and regions rather than simply choosing from among a pre-given set of geographical factors:

The analysis of urbanization, regional development, and industrial location must be based upon growth theory...one fundamental reason for speaking of geographical industrialization rather than 'industry location.' The sites of economic activity are produced in and through industrial growth, not selected after the fact (Storper and Walker, 1989 p. 36).

However, an equally critical part of Harvey's theorization of the spatio-temporal fix is this process's internal contradictions. Its investment is driven by a long-term bet

that sunk capital will be realized via new surplus, and the strategy constrains capital from fully exploiting more immediately remunerative investment opportunities that might arise once a period of crisis has passed. Likewise, Storper and Walker discuss both capital's creation of industrial regions and its abandonment of them. The problem of opportunity costs for capital means that while spatio-temporal fixes can be demonstrated to have been essential to the ongoing reproduction of capitalism, they can simultaneously be unbearable burdens to individual capitals.² Capital at rest or uncompetitively invested is capital devalued; capital(ists) outcompeted. Harvey argues that capital's compulsion to try to escape fixed capital investment into a more liquid form drives omnipresent threats of geographical creative destruction, at the extremes producing a fragmented entropic landscape incapable of sustaining accumulation.

Harvey often abstracts from the actions of specific capital fractions in these programs. However, in *Limits to Capital* (1982), he elaborates a model of finance capital's essential character and the nature of its power. He characterizes this capital fraction as particularly reluctant to make the kind of temporal commitments needed for long term land and real estate holding – and unusually free to elect not to do so. Finance has the most freedom among capital fractions to synoptically view streams of potential returns and move to seek highest and most minimally binding ones (of course, the more so as it geographically consolidates and providing that it gains the power over the state to knock down regulatory and legal barriers, indications of how historically and geographically contingent this power can be in practice). Simultaneously, actors in the sector can be particularly vulnerable to competitive devaluation. Accounts of twentieth century industrial powers' Keynesian and embedded liberal geographical industrialization programs (Block, 1977; Helleiner, 1994) unsurprisingly emphasize the enabling role played by state disciplining of finance in and after the Great Depression and World War II. Harvey argues that state-directed investment was critical in the US's twentieth century spatio-temporal fixes, constraining a then-smaller and less powerful financial sector to stay patient enough to make these long-term investments.

Taking up these ideas, what might a specifically “green” spatio-temporal fix look like, and look like at a time when investment and commercial banks, funds, and the US federal state have a very different relationship than they did in the New Deal-Keynesian era? Green economic development visions assumed major interest to powerful national governments including the United States in the wake of the 2008 financial collapse. The next chapter considers some of the large crisis-era investments that the US government made in the name of the green economy. These programs call back to the country's previous periods of large state investment, especially the New Deal.

To develop a spatio-temporal fix based on radically new kinds of resources and sources of value, as a green spatio temporal fix must, requires extra work, including actions over which territorial governments retain a monopoly even in the neoliberal era. Past chapters have picked up some of these interventions, made in service to ideas of energy efficiency as a resource and a resource in the built environment, and in support of the value of green building more generally. I consider the character of this state role more directly here.

Surveying Resource Frontiers

Public-private certification schemes and other legal geographies will play a critical role in structuring green accumulation in the US – or failing to adequately support the new kinds of value green economic proponents propose. This power engages a longer tradition of governmental work to create and maintain private property in land. This legal and regulatory web is needed to actively force unruly land and socio-natural processes to act like commodities on an ongoing basis; critical context in a time when Polanyi's "fictitious commodity" is being recruited in ever-more-complex property regimes. A particularly important theoretical question that scholarship on states' role in green accumulation and economic development must explore is how states' green economic programs must thus diverge from past capitalist economic development practice to realize a different kind of spatio-temporal fix. As discussed throughout this dissertation, broader green economic operation likely necessitates the widespread acceptance of new forms of intangible use and exchange value. It is difficult to imagine that mainstreaming of practice occurring without strong state support, or conversely to imagine a successful national green economic development program that does not enforce protections for these new forms of private property, quantifiable property value, and accumulation strategy.

The creation of private property in land has been an accumulation frontier dependent upon the intervention of state legal-regulatory apparatuses. Ongoing land enclosures in developing and post-Socialist countries testify to the continuing significance of these processes. Polanyi and others have chronicled the ongoing legal labor, communication of systems of social meaning, and exertion of police power needed to maintain the fiction that land and biophysical processes can be treated as private property and alienable commodities. The new kinds of green property emerging now assert similar needs. US government institutions are now intervening in real estate appraisal practices and moving to reshape property markets in important ways around the green economy – here moving to transform a real estate sector already highly structured by state regulations and enabling legal geographies.

Polanyi formulated his account out of the history of British enclosures – the experience chronicled by Marx and others as primitive accumulation, describing land expropriation, urbanization, and proletarianization. Ongoing land enclosures in postcolonial and post-Socialist countries testify to the continuing significance of these processes: political ecologists also increasingly examine how the formal enclosures associated with market environmentalism are overlapping with direct private appropriation of common lands. However, a brief historical survey of the governmental interventions required to initially produce these land and property markets in the US context can give us a better understanding of what a revolutionary transformation that undertaking was and is. Not only can we see important continuities with the present in this initial US land enclosure, we can see how it left durable structures in the frameworks of US property law and legal and regulatory geographies. It is precisely these existing legal landscapes (a product of historical building booms and development politics just as much as the physical landscape they shaped) that are being elaborated upon today.

Of course, a critical state role that must not be forgotten here is the command of force – ongoing now, as the experience of land grabs in many developing countries bears witness. American enclosures required violent expropriation of other sovereign powers and peoples, both native and European colonial, in the form of state-funded military

campaigns. However, creation of private property in land on a massive scale also required the exploration of technological and legal-regulatory frontiers. Real estate speculators and state authorities quickly exploited advances in surveying technology, methods for financing massive land purchases, and market disposal of lands to faraway Eastern and European populations (although with an extraordinarily high failure rate: many or most large land speculations collapsed). According to Linklater (2003), surveyors were a leading-edge technological profession of the day. And we must recall the historical importance of mapping land as making territorial claims in this context – the history of surveying played a critical role in American land rushes (Sakolski, 1933; Blomley, 2003).

The more detailed history here includes initial work needed to detach property from the specificity of ecological process, often involving radical simplifications (e.g., Cronon, 1983, Scott, 1999). Other critical intellectual and physical labor performed by surveyors and regulators was to represent land as abstract comparable parcels rather than specific places. This revolution in the abstract representation of land and nature involved replacing metes and bounds surveying with the grid, at an urban and national scale. Blackmar (1991), Upton (2000), and Scobey (2003) discuss the importance of New York City's 1811 grid plan in creating abstract space for land development and real estate speculation; Sakolski (1933), Blomley (2003), and Linklater (2003), among others, argue for the importance of the US Land Ordinance of 1785 and the national grid's subsequent significance for federal land grant programs, including the 1862 Homestead Act. A common thread in these discussions is the power that this formal legal representation of space has conveyed for the commodification of and speculation in land: the grid allowed often far-distant purchasers of plots imagined confidence that they were buying something tangible.

This history has analogues in the current moment in the rush to map and claim other kinds of frontiers, from ecosystem service values to communications bandwidth to the human genome. However, the unconventional forms of property being entrained to serve capital accumulation at the current moment are even more complex. Often intangible and even imperceptible without specialized analytical tools, these nascent property forms require new ways of popular representation. And critically, property owners, now as in the past history of land and resource grabs, have quickly required a legal and regulatory web to force unruly land and socio-natural processes to act like commodities (Polanyi, 2001 [1944], and see Cronon, 1983). The elaboration of US property law performed by MacPherson (1999) is a useful analytical tool here. His explication of the conception of property today as a bundle of alienable rights, including separable resource rights, is a critical one for conceptualizing the new forms of property being proposed by Costanza (1997) and other ecosystem services advocates (see also survey of this thinking explicated by Gómez-Baggethun et al., 2010).

Beyond these initial land enclosures and legal encodings of property, the US real estate system has continued to be embedded in a dense web of state regulations and legal geographies. In a sector in which use and exchange values coexist uneasily, formal structures of property law have been necessary to keep land and buildings – particularly homes – to keep functioning as commodities. This need has produced a massive body of property law in the US.³ Actors proposing new kinds of energy and environmental real estate value and property-linked financial instruments in the current

moment confront this existing legal and regulatory infrastructure. They propose to alter practices of real estate appraisal and underwriting and valuation norms at a federal level. Although these proposals in some ways echo those required to support the US's mid-century building boom and other major real estate market transformations and waves of construction in American history, the profundity of the value transformation that they propose in other ways more closely resembles the comprehensive state supports required by initial land enclosure. Broadly, green real estate proposals require restructuring market structures and property tax laws to protect new kinds of property value and create alienable rights of property ownership.

As discussed in the previous chapters, green economic development around real estate and the built environment, whether in the form of energy efficiency as a resource in a green real estate premium, requires significant labors of market construction.⁴ That discussion discussed market creation steps including altered methods of real estate value appraisal, the communication and marketing of emerging real estate market niches, the development of new financial underwriting practices and instruments, and the foundation of secondary financial markets and instruments, among other new kinds of practice. Collectively, proponents intend these structures to translate construction and retrofitting projects and behavioral management schemes into viable, self-supporting economic practices and arenas of accumulation. I argue here that changes to governmental structures constitute a critical front in these transformations, particularly changes in the real estate sector – proponents frame these regulatory and legal frameworks as a critical enabling or blocking authority.

The federal government is playing a critical role in developing structures by which green buildings and their potential energy savings are being formally valued in energy and real estate markets. As discussed previously, many of these sources of new value are intangible. They are similar to existing property in that they constitute one among a bundle of rights that can be attached to physical land (e.g., Macpherson, 1999). The greater novelty is that the value in question also depends upon regulatory structures, particularly effective climate policy.⁵

Setting Standards

National governments have a unique power to shape national economic space, to unify rules and conditions within a territory and to differentiate this space from those without. Governments have long exerted this power in the creation of monetary spaces, in the regulation of exchange, and in other calculative endeavors like the standardization of weights and measures. And they have employed their authority in previous attempts to protect new forms of value and intangible commodities, notably in the field of intellectual property and frontier financial instruments. Even more than these previous frontiers, state legal and regulatory structures (including but not limited to strong environmental policy) are required to establish and protect the green economy's intangible commodities and tenuous value forms.

The most important feature unifying green economic visions is that they propose “internalizing” environmental effects in economic functioning, valuing and commodifying ecosystem services directly, and otherwise unifying government environmental and economic policy. I consider the importance of national governmental authority in shaping the large economic spaces necessary – although not sufficient – to

effect such fundamental transformations in the way capitalist economies function, a critical power for meaningful national level climate change governance. This kind of governmental power has important precedents in other frontier economic sectors involving intangible forms of property – e.g., digital property, intellectual property more generally, and new financial instruments. In a context of neoliberal attacks on state economic protectionism, national governments’ ongoing power to delineate these kinds of unified, distinct calculative spaces is a critical question, even for powerful states like the US.

Green economic programs demand an assertion of national governments’ power to shape territorial industrial development (see also Lansing, 2012). Certainly in the United States they have attempted to do so overtly via the power of government investment in R&D: cleantech innovation has been a buzzword for the Obama Administration. This state role is consistent with past military Keynesian practice even if not with neoliberal ideology. But they also engage less visible but critical state powers that contain seeds of a potential return to state protections for infant industries. I suggest that a key power here is states’ ability to establish common calculative rules over a given territory, distinct from standards organizing other spaces. Although this authority covers key economic multipliers like the value of currency and exchange rates, it also invokes realms like the standardization of weights and measures that are less consistently framed as economic policy – any more than environmental regulation has been traditionally thought to be.

Exploring this power requires establishing some historical background on how states have effected legal-regulatory differentiation of territory, and particularly how they have used this governmental authority to produce national economic space. One of the most direct economic expressions of this power has been state control over exchange rates. As political economic historians have chronicled in depth, this ability to create and enforce economic space was critical in the formation of modern states under mercantilist policies. Brenner and other scholars have tracked the ongoing importance of these distinctions in the twentieth century, examining how relatively small changes in exchange rates have influentially altered the calculus between competing industrial based in different countries – i.e., how they work as a multiplier throughout national economies. These formal unifications of space overlap and are dialectically related to the material unifications of space effected by transportation-communications revolutions and the creation of national market space.

Even the most ideologically emphatic neoliberals have acknowledged states’ role in directing monetary policy (Ingham, 2004). The history of inflation control and Federal Reserve policy, both during the Keynesian national state-centered monetary system and in the post-Nixon era of floating currency and the Dollar Wall Street Regime (Gowan, 1999). We must think more broadly about the role of states in constituting monetary spaces, as put forward by Ingham (2004). Critically, he emphasizes the state’s power to establish this spatial consistency by stipulating what kind of legal tender it will accept for tax payments, and by prosecuting the creation of counterfeit currency. And we should think more broadly about the economic significance of state activities like the standardization of weights and measures (e.g., Linklater, 2003).

Returning to the examination of commodity frontiers that occupies much of this study, we should also consider how the US government, among other countries, has

moved to protect past forms of value that took difficult intangible forms. The most familiar in the current moment is likely intellectual property. National governments have effected pioneering regulatory and legal structures to establish and safeguard the value of R&D investment in things like intellectual and digital property. By doing so, the US government has attempted to support visions of an ongoing US global “comparative advantage” in high tech research and design. And we should also think of earlier precedents for this state role in US governmental moves to valorize financial instruments like stocks earlier in the nineteenth century, as discussed by Teaford (1984), McDonald (1986), and Sbragia (1996). These interventions matter in questions about how to value intangible property like stocks for taxation purposes, and what broader rules should establish and protect them as a form of private property. All these questions have become more complex as late twentieth century financial industry experimentation has produced a host of complex financial derivative products (Strange, 1998).

Unifying Environmental and Economic Policy

A critical dimension of national state authority vital to enacting green economic development’s vision is in supporting its proposed unification of economic and environmental policy across large market spaces. In investigating the construction of new energy and the built environment industries in the US, past chapters described how these green economic sectors demand the definition and commodification of new forms of green value. I also found that these nascent commodities are fragile in important ways – their ongoing existence may depend on economy-wide shifts in energy pricing, their own mainstream adoption, and other social and economic transformations.

Even more than previous commodity frontiers, state legal and regulatory structures are required to establish and protect the green economy’s intangible commodities and tenuous value forms. New green commodities are fragile in important ways: their ongoing existence may depend on economy-wide shifts in energy pricing, their own mainstream adoption, and other social and economic transformations. I argue here that federal government action is necessary (although as ever perhaps insufficient) in creating these conditions. Although it is not limited to the sphere of environmental policy, this task unifies environmental and economic policy in new ways. Under the largest scale visions of green economies, national environmental regulation can create the same kind of territorially comprehensive revaluings and distinctions between national spaces as more conventional tariffs and exchange policies. This argument repeats many of the assertions of prisoner’s dilemma arguments about climate change – i.e., that if national climate change mitigation policy sets an economy-wide price on greenhouse gas emissions, the pervasiveness of fossil energy use in industrial manufacturing means that producers in a national economy with priced greenhouse gas emissions will operate with a systemically altered calculus than in one without. However, following ecosystem services logics, which reframe environmental challenges as untapped markets, it suggests that if the green economy works, this kind of economy-wide revaluation can become an economic advantage rather than a liability.

Mackenzie (2009) presents a similar logic in his discussion of greenhouse gas emissions trading. He suggests that different gases’ global warming potentials can come to function as de facto exchange rates in these markets. However, he only partially brings geographic dimensions into this discussion. We need a more complete understanding of

how these multipliers produce distinct territorial spaces. National standards-setting and value-enforcing power is particularly critical in dealing with green value's more difficult aspects as a basis for accumulation. Because as discussed it is intangible and is not fully enclosed as private property, it might ultimately depend on universal global enclosure to carry secure value at all – either a universal market (or encompassing significant enough percentages of total economic flow or sufficiently preventing leakage that lack of universality might not matter). And a relatively unique correspondence exists between universal/effectively-enough-universal market and regulatory regime here. States cannot aim small, partial solutions in any kind of convincing way in this endeavor – which ultimately means effecting difficult trade-offs between nascent green sectors and existing powerful industries; i.e., compelling producers to leave still-exploitable fossil fuels reserves in the ground. Here, however, we must remember that threatened environmental destabilizations may in the slightly longer term create impulsions for these kinds of whole-economy responses (i.e., for various adaptive responses) regardless.

Green economy proponents are thus working with national governmental institutions in attempts to establish the supportive legal geographies needed (at the very least – advocates often understate challenges of confronting existing fossil fuel interests or capitalist growth imperatives) to give its new frontier resources, proposed forms of value, and intangible commodities value in a national economic space. In terms of a spatio-temporal fix, large green infrastructural investments only have economic meaning insofar as this infrastructure is actually valued. As Harvey discusses, as a capitalist state strategy spatio-temporal fixes internalize a central speculative tension – they can never be assured that these large investment programs will realize new value. They may save overaccumulated capital from immediate devaluation in a crisis only to see this capital devalued over the longer term if their investments do not pan out. In the case of green economic development, successful value realization thus makes large demands upon the state in a legal-regulatory as well as an investment capacity.

For example, in the United States, even partially non-export sectors like utility energy delivery and green real estate and that are to a degree shielded from global competitive pressures and global markets/market price pressures⁶ may have a limited future without the expectation of national climate change regulation. By altering the energy calculus across the whole economy, these policies would make energy saved via efficiency programs a substantially more valuable resource and green/energy-efficient buildings significantly more desirable properties. More broadly, a green spatio-temporal fix's conception of accumulation on a "new and higher plane" is materially different from past spatial fixes: its vision for enhanced social wealth is sustained socio-environmental reproduction and security, rather than a conceptually simpler industrial productivity rise or technologically facilitated increase in baseline material standards of living (for some defined population). Its success as a public and private accumulation strategy thus rests on the popularization of new conceptions of social wealth and market value rooted in environmental change mitigation and resilience.⁷

Protectionist interests old and new have embraced the potentially game-changing potential of this new unification of environmental and economic policy – the notion that protecting societies and human welfare from catastrophic environmental destabilizations requires rethinking free market utopianism. In the United States, a green collar jobs bloc encompasses a combination of older manufacturing interests and emergent cleantech

sectors. But this unity has also not gone unnoticed by the World Trade Organization (WTO). That body is hearing challenges of environmental policies as economic protectionism. Critically, free trade interests have launched protests against various environmental policies as violations of WTO anti-protectionism agreements.

The Paradox of Finance

Seeking both to rebuild finance's patina of neutral expertise and to develop badly needed new lines of accumulation, financial industry players proposed a wave of their own "green" innovations in this period. A globally powerful financial industry does not just offer itself as an ally to state programs. Increasingly, banks and funds compete with governments to claim the massive resources and expertise necessary for imagining and realizing climate change responses. Only a few kinds of players in the contemporary global economy can command the massive resources needed for the thoroughgoing economic transformations proposed. Equally few have the "control function" capability to act as a techno-organization brain for capital: to facilitate the rise of frontier industries, and hasten the fall of outmoded sectors. Illustrative statements of how some sections of finance seek to place the industry vis à vis climate change include the following (e.g., Deutsche Bank Advisors, 2008; Della Croce et al., 2011; Bloomberg New Energy Finance, 2013; Frankfurt School-UNEP Centre/Bloomberg New Energy Finance, 2013). Not surprisingly, the leading edge of much of this work is an attempt to find novel accumulation possibilities offered by climate change, in both green economic development and in the destabilizations and volatility created under climate change conditions (some of which is virtually inevitable now even if greenhouse gas emissions were cut to zero today).

Opportunities for Finance

The geographic nature of climate change itself may create opportunities for finance within today's globalized economic system. Specific attributes of importance include climate change's economically pervasive and myriad drivers, its expression as heightened systemic risk and volatility, and its complex scaling and systemic nature.

First, the scale of transformation required for significant climate change response, either mitigation or adaptation, requires whole-economy transformations or redirected courses that will require massive resources. Greenhouse gas emissions pervade most areas of industrial economic life, both production and social reproduction. Considering greenhouse gases with fluxes that have been perturbed by human action – carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and manufactured gases (SF₆, HCFCs) – as pollutants to be regulated means considering spheres that had only been peripheral to previous apprehensions of environmental significance and regulation. Although most often represented as the cost side of climate change cost-benefit calculations, viewed from the perspective of new resource creation this presents a massive nascent market. Nevertheless, effecting this kind of whole-economy transformation would require a scale of resources that only a few kinds of players in today's capitalist world-system can command.

Another attribute of climate change that has inadvertently proven useful to the worldview and accumulation strategies of finance capital is its manifestation as conditions of increased endemic uncertainty in many spheres, volatility, and risk. Climate researchers, the Intergovernmental Panel on Climate Change (IPCC) and its emissions scenarios group (IPCC, 2000) have made dedicated efforts to project a band of probable future climate change and variability. However, their strategic assessment remains delimited by the things like the distinct possibility of low-probability, high-impact events; for example, abrupt climate change resulting from the slowdown or shutdown of the ocean thermohaline circulation. Financial actors are increasingly arguing that this risk is something with which the industry is uniquely well placed to deal (Johnson, 2011). Financial institutions and insurance companies define themselves around sophisticated risk-handling, more than any other industries. The rise of derivatives has heightened this self-definition. Of course, the story of visions like Shiller's (2003) "democratization of finance" provide a cautionary tale here. Shiller argued for the creation of innovative financial instruments and a massive uptick in the financialization of everyday life in order to mitigate risks in a more total way; ultimately, this kind of vision helped build popular acceptance of subprime loans and other exotic instruments in the 2000s. In addition, questions of indeterminacies in future climate dynamics and "uninsurable" risks associated with climate change looms. If the climate system, like many other non-human environmental systems, remains to an important extent undisciplinable according to human logics, the provision of security may fall to governments and other more public-minded players.

A third key feature of climate change highly relevant to capital accumulation attempts is its systemic nature. Transformed greenhouse gas emissions fluxes and forcing of the global climate system operate at the most synoptic of multiple geographies of environmental change. These additional phenomena include perturbations of the nitrogen cycle and deforestation, as pointed out by human dimensions of global change analysts like Turner et al., 1990. See also Millennium Ecosystem Assessment, 2005 for this kind of scalar analysis and Sayre, 2010 for some reflection on the scalar problem climate change represents. What climate change's global scaling means in practice is that altered emissions from myriad small sources diffuse rapidly and evenly in the atmosphere and produce systemic alterations in the aggregate and over the long term. Any one forcing point may be temporally disconnected from its effects on climate-dictating flows in the atmospheric system. For example, large long-term emissions sinks like ocean absorbed 150 years of dramatically increased human GHG emissions production before reaching capacity and shifting accumulating excess carbon to the climate-affecting pool of GHGs in the atmosphere. And each emissions point source is similarly geographically disconnected from its share of systemic forcing and the felt effects of this alteration. The mediating non-human logics structuring average climate conditions and variability mean, for example, that the US can be the second largest aggregate emitter according to current inventory reports yet be projected to experience far less profound climatic alteration than low-emitting countries like Bangladesh.

Climate change's systemic nature is a serious challenge to effective mitigation policy. However, it also aids global finance, potentially transnational corporations, and other actors with global visions of potential accumulation frontiers and ability and interest in shifting investment between these places. This global synoptic vision and

mobility is congruent with global finance's existing mode of apprehending the world as a "flat earth" of streams of risk-weighted return on investment. Lohmann (2005, 2009), Mackenzie (2009), Lovell and Liverman (2010), and Lansing (2012), among others, have explored how the construction of GHG emissions inventories and schemes to regulate emissions via market instruments imposes a common calculus on disparate socio-nature practices and geographies. These comprehensive framings bring in new geographical scaling and connections. We can see these trends in more than just open markets. Massive institutional investment funds like Deutsche Bank's climate fund (e.g., DBCCA, 2008, 2011) demonstrate the kind of internal global accumulation strategies that they can develop in response.

For example, in DBCCA's 2008 report *Investment in Climate Change 2009*, the asset manager lays out its so-called "investment universe." Notably, this array of strategies includes both mitigation interventions – actions like switches to renewable power generation and promotion of building energy efficiency meant to forestall dangerous climate change – and adaptation programs like "sea defenses" and desalinization meant to cope with climatic transformations that are not prevented. Strategies include pioneering new financial and insurance products to cope with environmental instability like weather derivatives, discussed in-text relative to the ability of companies to hedge their weather related-risks. This type of product is increasingly being marketed to Global South farmers, alongside other developing country financialization frontiers like microfinance critiqued by Roy (2010). Notably, the listed investment frontiers here also encompass fields that have been directly linked to large-scale land grabs in the Global South, activities including biofuel feedstock cultivation and carbon offsets. They also now include investments as diverse as green skyscrapers in world cities.

Financialization as Obstacle

Governments' crisis-era statements often connected green economic visions to critiques of finance and financialization. They joined broader arguments that during the neoliberal era, the financial sector had grown at the expense of the "real economy" of production. Cleantech advocate claimed more specifically that policies abetting financial speculation in the US and other powerful states had led these countries to neglect the task of developing environment-sustaining technologies and markets. For example, experts convened by UN-Habitat, meeting in 2011 to help the institution develop a program for merging its traditional urban development and sustainability work with a new focus on green economic development, advanced a characteristic critique of 2000s era financialization. They argued that a key lesson to learn from the economic crisis was that both green innovation and economic recovery depended upon "the redirection of financial investments away from speculation and into productive capacity" (UN-Habitat, 2011). In the US, the incoming Obama Administration developed a rhetorical program of real economic growth, manufacturing rejuvenation, and good "green collar" working class jobs. This vision of economic recovery and rejuvenation, which it funded through the American Reinvestment Recovery Act (ARRA) in 2009, spoke to the country's immediate and longer-in-the-making crises: outsourcing trends and growing working class economic insecurity (racialized, as always in the US) that was critically exacerbated as the subprime collapse and subsequent recession decimated working and middle class

wealth. Green economic sectors, including cleantech start-ups proposing large-scale renewable energy technology manufacturing and the differentiated energy efficiency interests analyzed more closely here, received significant support and investment in ARRA and other Obama Administration economic recovery and development programs.

Despite these policy statements' critiques of contemporary finance, its speculations, and its outright malfeasance, neoliberal assumptions about the role of finance continue to pervade many ostensibly novel green economic development visions. Finance poses an ongoing threat to the autonomy of twenty-first century nation-states, including their ability to realize proposed Green New Deal-type visions.⁸ Earlier discussions of finance's role in high tech financing, and now cleantech financing highlight one problem here: i.e., that with energy services startups, venture capital continued its patterns of speculation on light-footprint software companies in preference to the riskier large fixed capital commitments of cleantech manufacturing. The broader constraints on state action created by thirty plus years of neoliberal policies and finance's increasing power vis à vis governments, including those of powerful countries like the US, are even more of a concern here. Resurgent finance post-collapse and government bailout quickly moved to enforce austerity policies, even vis-à-vis state recovery programs.

For example, influential mainstream scholarship on climate change mitigation policy has long questioned the adequacy of national governmental authority as a level of greenhouse gas emissions governance, pointing to climate change's global systemic nature. Myriad anthropogenic greenhouse gas emissions sources and these emissions' generally rapid and even diffusion in a common global atmospheric pool make attributing responsibility for climate change technically and politically difficult. Greenhouse emissions fluxes altered anywhere contribute to climate change, and the effects of climatic changes bear no geographic correspondence to emissions hotspots.⁹ Once the climate system is forced, manifestations and human exposures and vulnerability to this alteration will have completely separate causative logics and projected geographies. Critics are right that this geographic disjuncture presents intense management problems – as well as fodder for potential twenty-first century geopolitical conflicts – meaning as it does that the US and other countries with high emissions and low immediate exposure to climate change impacts might get away with denying or delaying politically demanding mitigation programs.¹⁰

Considering this problem, economically minded observers have argued that climate change creates a natural “prisoner's dilemma.” The commentators argue that unless political regimes of greenhouse gas emissions control can be made globally comprehensive, emissions reduced in one place may always be displaced to a location outside this regulatory space – the problem of geographic “leakage.” In practice, political actors have cited this concern as a justification for avoiding or delaying ambitious national climate change mitigation programs. US critics of national emissions reduction commitments have taken up this argument. They have argued that reducing emissions in a highly fossil fuel-intensive industrial economy like the United States would require intrusive regulation of industrial manufacturing and utilities, as well as other economically transformative state intervention. They argued that undertaking this degree of economic disruption would be risky for the country's industrial economic competitiveness. If, for example, carbon dioxide pricing – via carbon trading, taxes, or

some other form of regulation – raised energy prices economy-wide, domestic manufacturers would face increases in their cost of doing business. Critics pointed to other industrial countries' failures meeting their stipulated emissions reduction timelines under the Kyoto Protocol and more particularly the fact that developing countries were not made subject to the same emissions reduction requirements expected of more established polluters like the US. They argued that strongly regulating US companies would thus risk loss of industry abroad to less environmentally stringent countries. More particularly, US commentators observing the rise of China and other BRIC economies have long argued that the US should not sign onto emissions reduction commitments if China did not do the same.

These debates begin to reveal that this particular prisoner's dilemma is more social construct than inevitable outcome of the nature of the climate system. These critiques assume global free trade and capital mobility – contingent products of a specific era in world capitalism. They are influenced here by broader late twentieth century arguments claiming the decline of the national state as an effective scale of control over increasingly transnational production systems and globally mobile, offshored finance capital. This assumption of the state's inadequacy as an economic manager comes partly out of neoliberal ideological hostility to state regulation of markets (although of course the actually existing neoliberal state remained necessary in reproducing supposed free market systems – e.g. Peck and Tickell, 2002). The operationalization of this rhetoric materially weakened states' power in key areas like the regulation of finance, giving these arguments force to make some of their prefigurative diagnoses reality.¹¹ This critique was also influenced by techno-utopianism around the power of the Internet and technologically advanced capitalism and framings of economic globalization as a quasi-natural, inevitable state.

These prisoner's dilemma critiques also take as axiomatic the kind of fierce, zero-sum national industrial competition produced via both the rollout of these ideologies and preexisting technological-economic trends and geographies – the kind of system in which industrial producers could be substantially threatened by a localized increase in their costs of production.¹² As Brenner (2006) and others have discussed, these historical changes include the US's post-1960s decline from world industrial predominance and worsening overproduction and competitive devaluation as one after another export-oriented industrial powerhouse rose and struggled to produce for the same markets. The unleashing of global finance capital and the spread of neoliberal free market utopianism constrained countries' options: in the late 1990s, countries agreed that formal protectionist measures could be legally struck down in litigation via the new World Trade Organization (WTO). Political restructurings have their own logics and ways of persisting over time, both the international capital and trade controls rolled back in the Keynesian and neoliberal eras¹³ and the political institutions like the WTO produced recently in this process. Doxic free trade assumptions and zero-sum industrial state competition have plagued US export-oriented cleantech industries, indicating that these structures continue to shape – and potentially constrain – economic development possibilities in the current moment.

This story provides only one example of the way that finance has disciplined states in the last thirty years. US state structures have been altered by neoliberal changes in thoroughgoing ways, as governmental institutions became battlegrounds for the

removal of capital controls and other financialization processes as well as for the ongoing rollback of protectionist trade barriers. Moreover, the neoliberalization of institutions like International Monetary Fund (IMF) and the World Bank made states more vulnerable to financial disciplining of their economic policy, a dependence that has compromised their autonomy to enact spatio-temporal fixes like a Green New Deal. Austerity compulsions throw up obstacles in the way of transformative new policies. For example, post-crisis austerity policies and financial industry power pressured governments into near-term cost-benefit rationalizations of expenditures. These constraints may adhere even with investment programs as necessarily speculative as a large-scale spatio-temporal fix in general, and in a highly unorthodox sphere of accumulation in particular. And they do much to illustrate the pressures that may continue to block radical structural breaks in existing places, impelling frontier economic development into fresh, unencumbered geographic contexts.

Perhaps the most important paradox coming out of these dynamics around the green economy is that if states cannot secure enough power and autonomy to support the new kinds of value and resources proposed, this failure may significantly constrain the kinds of climate change investments banks and funds can make. Thus, even as particular financial players like these funds develop climate change strategies, the broader context of financialization threatens to hurt the state's ability to be an ally for finance in supporting these frontier markets.

Toward a Conclusion

To summarize, this introduction has surveyed a range of ways in which the enactment of green economic visions laid out by industrial powers post-2008 collapse requires strong state legal-regulatory supports at the national or large territorial scale: the market environmentalist schemes discussed in previous chapters rely heavily on state standard-setting power as well as direct subsidies. This authority adheres strongly in the sphere of real property development and finance, the sector that is of most immediate importance for the green building and energy schemes that are the focus of the current research. And the intangible commodities being proposed as frontier arenas of green accumulation in this market space – energy efficiency as a resource, green real estate premiums – may founder without strong climate change mitigation regulation; i.e., greenhouse gas emissions restriction powerful and geographically encompassing enough to transform energy and emissions valuation across large, economically significant territories. However, the chapter also discussed the ongoing power of global finance, and how finance may be currently working against this national territorial space-making authority. Even as new financial schemes in a green economic space require governmental supports, a history of financialization may thus now undermine states' power to establish these kind distinct territorial economic spaces. The next two chapters will consider these dynamics further, digging deeper into US federal green economic investments and Green New Deal framings in the aftermath of the finance collapse and exploring how cities and urban governments are framing themselves in relation to green economic possibilities and twenty-first century financial realities.

Chapter 7: Financialization and a US “Green New Deal”?

In the late 2000s, the world’s largest industrial economies reeled in the wake of the 2008 financial collapse. European governments struggled, the Bush and Obama Administrations approved massive aid packages to rescue many of the world’s largest financial institutions from collapse, and China and other economies that had hurtled to world power on the strength of their exports to the United States and Europe confronted major losses. As the depth of the late 2000s crisis shook these powerful countries, international economic institutions and national governments cast around for growth sectors that might drive economic recovery. In this conjuncture, important voices took up the emerging field of “cleantech,” frontier technologies that seek to make climate change mitigation and other environmental action profitable. At their most ambitious, these proposals imagined a “green economy” that would thoroughly transform twenty-first century capitalism, “a global Green New Deal” (UNEP, 2009). Governments including the United States, China, Germany, and Japan incorporated green economic rhetoric and cleantech investment into economic recovery programs. In total, they spent anywhere from \$184 billion (Pew, 2010’s estimate) to \$430 billion (according to HSBC, 2009) on renewable electricity generation technologies (primarily wind and solar power), biofuel development, energy efficiency, and other green technologies and services. This chapter examines the US experience with these programs, as the Obama Administration rolled out a stimulus packaged that dramatically increased funding for certain kinds of cleantech and green enterprise.

I argue, first, that building and built environment programs played an important role in the US’s “green” economic recovery package, first in the sense of an unemployment relief program. Targets for stimulus funds included the expansion of low-income home weatherization, and the extension of private energy auditing and retrofitting to new markets: to a broader swathe of large commercial buildings and, critically, to homes and small businesses. They also included the growth of private solar installation and renewable energy companies, many of whom targeted homeowners and businesses for rooftop solar panels and other on-site renewable energy systems. I first discuss these efforts as a stimulus and employment program. In the United States, one objective of this spending was to quickly create jobs in a sector struggling in the wake of the property boom and bust of the 2000s. Construction has been a longer-term go-to sector for working class jobs creation and government redistribution in a crisis, from the road-building handouts of US urban machines to the massive construction projects of Parisian Haussmannization and the New Deal. I suggest that green construction is not that much of a stretch from this existing model, particularly because the Obama Administration believed – only partly accurately – that an infrastructure already existed to quickly roll out weatherization work.

However, I further argue that the energy provisions of the US stimulus package also invoked longer term economic development, and that it is actually in this regard that the moniker of a Green New Deal becomes most apt. Green economic advocates envisioned the project of greening the built environment, and the construction, manufacturing and other working class “green collar” jobs that it might create, as part of a deeper program of technological and economic transformation. In a moment of crisis

and political and economic questioning, futurist images of a green economy promoted a vision of capitalism and capitalist states still capable of accomplishing great tasks. Beyond their immediate political usefulness, these ideas spoke the twenty-first century forms of hegemony: how states might legitimate their power by successfully addressing climate change. Challenges include mustering the major resources needed to transform industrial energy systems and cities, building social and economic resilience, and making those efforts strengthen national economic and political power – many countries resist the idea of sacrificing growth in the name of global environmental and social welfare. The Obama Administration looked rhetorically to both the New Deal and the Space Race as moments of technological break facilitated by the federal government (White House, 2011) an argument that the administration advanced throughout its first term and into the second (White House 2009, 2010, 2012, 2013).

In these programs' invocation of the New Deal as a precedent, they support an interpretation of it as a set of governmental programs that actually generated economic growth, working class employment, and industrial-energy system transformation in the United States economy – in other words, as more than just a crisis-era employment program. This interpretation has long been a point of struggle, one that reflects neoliberalism's hostility to non-military state economic interventions as much as the actual empirical facts of this history. The challenge implied by this rethinking of the New Deal is that it directly opposes neoliberal arguments that the state cannot generate economic development, that that task is the province of private players including finance. Green collar critiques of this neoliberal argument argued that without formal industrial policy, the US's de facto economic strategy in the decline of the New Deal-Keynesian order was to support financialization and the offshoring and transnationalization of production. They maintained that green economic development could return needed support for manufacturing and growth in the "real economy," a term that excludes finance and financial profits.

As green programs envisioned the real economic growth potential of green building and retrofits, they considered activities including construction and retrofit work itself and the manufacturing of advanced materials. However, the rollout of green economic programs in construction, and particularly homebuilding, confronts a historically difficult sector for "modernization" attempts. Construction contains elements of both services and manufacturing, and demands highly localized, on-site labor. Buildings' fixed, non-transportable nature as a commodity and other local factors necessary to successfully developing real estate kept many segments of property development and construction localized, even as other US sectors saw the growth of vertically integrated national and international corporations. In addition, the weight and unwieldiness of many building materials for centuries kept materials sourcing relatively local. Previous US government programs to modernize construction and development, notably ones initiated in the Progressive Era and continued through the New Deal, have confronted these characteristics as problems.

Whether or not green building and advanced materials programs can overcome the sector's difficulties to support green economic growth depends on successful technological innovation, but it also has a lot to do with the way that the construction, development, and building materials and equipment are now organized, and organized geographically. Past governmental construction modernization programs often focused

on the inefficiency of the building industries, particularly homebuilding. They targeted the potential for economies of scale and factory production, which meant prefabricated components and on-site assembly in this case, to make homes more affordable for mass working and middle class markets. As green economic advocates consider additional environmental economic purposes that a revolutionized building industry might serve, they confront a central value question: does the building industry create new value for particularly places, or merely extract from an urban economy's existing wealth? If building and materials industries develop products and product-tied services capable of being exported to other places within the United States and globally, can they act as an urban economic engine in a more fundamental way? These questions, and the economic surplus at stake, may depend upon the success of the new value forms and resources discussed in the first part of this research. If energy efficiency becomes a durable, increasingly valuable resource, and green buildings become more valuable, they will create many new possibilities for the construction and development industry – or not, if these value propositions fail.

Finally, I argue that the power of finance and financial imperatives in the US economy poses critical challenges to green construction and materials programs, as they do to visions of a green economy more broadly. This ongoing power of finance today, despite the 2008 collapse and widespread anger at financial institutions' culpability, offers a dramatic contrast to its weakened position in the New Deal-Keynesian financial order. I illustrate the effects of this financialization via further examination of homebuilding and advanced materials programs. For example, 2000s-era changes in homebuilding, including the geographical centralization of that industry, were not motivated or enabled by the kind of technological innovations and economies of scale long hoped for by government modernization programs. Instead, research now shows that they were driven largely by land speculation and enabled by the largest homebuilders' privileged access to finance. In addition, advanced building materials start-up have confronted some of the same difficulties as would-be solar panel manufacturers in the United States: a reluctance to finance capital-intensive high tech inherited from neoliberal era "industrial" policy. Ongoing research must dig deeper into these questions of whether a reworked green economy can deliver on rhetoric of real economic growth and good employment.

Visions of a Green New Deal

Facing a profound economic crisis and challenges to neoliberal orthodoxy and political legitimacy, the newly elected Obama Administration swept into office on the promise of new hope both for progressive politics in the United States and for renewed national greatness in a time of deep recession and widening inequality. The administration's determined message of optimism and program of ambitious new investment recalled the Roosevelt Administration and the New Deal. Cleantech and the green economy claimed a sizable portion of those funds. The Obama Administration and 111th Congress approved \$67 billion for green economic programs under the 2009 American Recovery and Reinvestment Act (ARRA). Some came in the form of direct spending, and some in the

form of tax incentives and other indirect subsidies (Pew, 2010; using broader criteria, HSBC, 2009 estimates \$94.1 billion).

Energy efficiency retrofit programs were very important in the administration's visions of a green economic stimulus. Green collar jobs advocates strategizing in the aftermath of the collapse of the US's 2000s building boom quickly focused on building energy retrofits and dedicated construction jobs as a major potential source of working class relief employment, one that might particularly target the construction jobs erased in the collapse (Chapple and Hutson, 2010). As discussed in Chapter 3, the Obama Administration expanded weatherization programs, emphasizing their stimulus importance as sources of "shovel-ready" jobs. Weatherization programs seemed to present many advantages to the Obama Administration as it sought unemployment relief and economic stimulus opportunities that could be quickly rolled out nationwide and produce jobs immediately. This need was exacerbated by pressures on the administration to produce cost-effective results quickly. These demands proved challenging for the many kinds of green economic industry that stood in early development stages and posed only uncertain job creation prospects. By contrast, the administration could argue that weatherization programs were a fully worked out economic and environmental proposition whose potential had only been held back by their heretofore chronic underfunding and uncertainty. This task proved more difficult than expected, although the final results on job creation are only now being assessed.

However, the administration envisioned a broader role for the green economy, and construction and building programs in the green economy, than this immediate unemployment relief function. They envisioned a new capital-labor compromise around domestic cleantech manufacturing. Their invocation of the New Deal thus calls back to its programs as more fundamental economic development achievements, as a previous era of state-supported economic transformation. Going beyond this governmental rhetoric to evaluate the aptness of this comparison, I dig deeper into the New Deal as a moment of industrial and energy change. I argue that in this past era, state infrastructural investments and other supports paved the way (literally) for a simultaneous transformation in the country's energy system and the rise of industries of the Third Industrial Revolution – technological breakthrough experienced in part as a wave of new "modern" domestic technologies.¹ In comparison, Obama Administration programs have so far fallen short of both their own rhetoric and their callback to the more ambitious programs of the past.

The New Deal Energy-Industrial Transition As Precedent

The New Deal that green economic advocates recall today is a set of government programs that helped a major energy and industrial transformation in the United States.² This state-supported changing of the guard was a critical way in which the New Deal acted as not simply a stimulus but an economic transformation program, something very much on the mind of Green New Deal advocates today (Grunwald 2012a, 2012b).³ When the US rose to agro-industrial prominence in the nineteenth century, its manufacturing relied on steam and coal (Nye, 1992). Major nineteenth century American industries included railroads, steel, machinery; characteristic industries of the 2nd Industrial Revolution.⁴ By the Great Depression, these Gilded Age industries were fading (Bernstein, 1989). Meanwhile, new challengers like automobile makers, electric manufacturing companies and other machinery manufacturers, oil, and the chemical

industry developed a challenge to this older techno-industrial regime (Block, 1977; Ferguson; 1984, 1989).⁵

These rising industries also drove the formation of a new fossil fuel and energy regime, chronicled by Smil (2000) as an epochal shift and diversification of energy provision to include petroleum and natural gas and electric power, as well as direct combustion of coal for heat, steam/motive power, and illumination (via coal gasification). The interests of automobile manufacturers, and increasingly older industries like rubber, glass, and steel, increasingly aligned with those of Standard Oil and other petroleum products refiners. Chemical industry pioneers developed similar tight connections with the oil industry via use of petroleum for feedstocks (Chandler, 1977; Ferguson, 1984, 1989). Large chemical companies and the massive, oligopolistic electrical machinery producers that had risen late in the nineteenth century, General Electric and Westinghouse foremost, took common interest in the hydroelectric possibilities of massive dams - Niagara Falls, and the new massive Muscle Shoals and Boulder dams (with important new projects to follow in the New Deal and after) (Chandler, 1977; Hughes, 1983). Meanwhile, the electric manufacturers' oligopoly extended from manufacturing in Europe (Chandler, 1977) to forward integration into private utilities and increasingly large and financially speculative utility holding companies. With dam construction and other major US electrification pushes during World War I, such as moves toward regional electrical grid interconnection, they shaped the modern US electricity sector (Hughes, 1983; Nye, 1992, Hirsh, 1999).

Bernstein (1989) argues that before the Great Depression, this rising Third Industrial Revolution bloc⁶ remained too weak politically and economically to surpass older industrial interests – while it faced direct zero-sum competition with these established industries in key fields like urban transportation systems and home energy and appliance suites. Ferguson (1984, 1989) tracks how early in the Roosevelt Administration, these newer industries turned toward Roosevelt and the Democratic Party, looking away from the Republican Party and its nationalist, protectionist System of '96. This industrial bloc united behind the New Deal coalition, as did major US investment banks. The state's redistributive economic development programs under the New Deal and the mobilization for World War II critically supported the realization of this new industrial order, facilitating the deployment of younger industries and hastening the decline of older industries like steel, textiles, coal⁷ and other Gilded Age interests.

One key way that the New Deal-Keynesian order supported the growth of Third Industrial Revolution industries was to address a structural problem in that era's economy: that despite the US population's wealth as a whole, domestic mass consumption was not keeping up with production. This problem threatened producers across the board with potential overproduction and forced write-downs of capital.⁸ The Great Depression dramatically exacerbated this more deeply rooted imbalance. The country's economic inequality coming out of the Gilded Age meant that many workers could not expect to buy homes and other large capital goods like automobiles without the support of higher wages and employment security. The New Deal administration helped forge the normalization of a business unionism – purged of its Depression era radicalism – and welfare capitalism, including formal recognition of unions. The New Deal-Keynesian state also realized Progressive Era visions of the mass expansion of working class homeownership, supported by a massive structure of state subsidies and the

normalization of long-term working class debt. Although these state campaigns aided capital in general, their focus on promoting mass consumption particularly promoted uptake of the personalized mass consumption suites produced by Third Industrial Revolution industries (Walker, 1977; Nye, 1992; Tobey, 1997; Cohen, 2004).

New Deal programs also included more direct supports for this political economic bloc in the form of massive infrastructure investment and urbanization programs. Among other New Deal large infrastructure construction projects, these included the massive rural electrification and Southern regional development programs of the Tennessee Valley Authority (TVA), other hydroelectric dam construction, and road-building programs. Industrial beneficiaries included electric utilities and manufacturers (General Electric and Westinghouse long constructed larger machinery and industrial plant for utilities, well before they diversified into a broad range of consumer appliances) and large engineering-construction firms (notably Kaiser and Bechtel), as well as the broad collection of industrial interests that lobbied for better roads and automobility (Hughes, 1983; Adams, 1997; Tassava, 2003; Walker, 2008b; Henderson, 2011). Walker (1977, 1981), Tobey (1997), Cooper (2008), and Harris (2009) argue that the New Deal's urban infrastructure programs also critically subsidized the new technologies and industries. (See also discussions in Nye, 1992 and Hise, 2003.) Besides the increased consumer markets for domestic technologies – importantly refrigerators, electric ranges, and other kitchen physical plant components – that state-supported electrification created, government aid centrally included programs to retrofit existing homes and to revolutionize the broader design of the home around electrical and technological modernization.

This alliance continued through World War II, with wartime procurement and infrastructure construction. It took new form in the postwar context as General Electric and other industries of the new bloc expanded their multinational interests with the support of US government programs like the Marshall Plan and Bretton Woods institutions' rollout of international free trade policies (Block, 1977; Chandler, 1977; Henderson, 2011). And this aggregation of interest shaped the conditions for the long post-World War II boom of urbanization (especially in the Sunbelt) and suburban home construction, as well as ongoing urban renewal and infrastructure modernization in older downtowns (Caro, 1975; Mollenkopf, 1983; Hartman, 2002; Weber, 2002; Self, 2003). Ultimately, this boom effected the normalization of a new standard of mass consumption in the US, the popular take-up of a suite of new domestic and workplace technologies, and a major transition in the country's level and type of fossil energy consumption. It is thus both ironic and apt that this experience had become a model for neo-modernist energy-industrial transition visions today: these programs created much of the fossil fuel and GHG emissions-intensive landscape that today's programs are trying to reshape, even as their scope and ambition serve as a key precedent for today's visions.

A Green New Deal?

The late 2000s context presented important similarities to these historical conditions. In the United States, the profound and protracted economic crisis that followed the 2008 financial collapse had deeper roots in the country's fall from industrial supremacy (Harvey, 2003; Brenner, 2006, 2009). In 2008, the Obama Administration's inclusion of green collar jobs advocates and other labor voices helped it frame cleantech policy as not

simply support for a new sector of high tech but also a program with more power and responsiveness to speak to the crisis era and the decades of widening economic inequality that had preceded it in the decline of the New Deal-Keynesian order. Cleantech proponents point to the New Deal as precedent (Jones, 2008; Grunwald, 2012a, 2012b) to argue for a similarly transformative alteration in the country's industrial and energy system. They demand a thoroughgoing shift to alternative energy sources and their infrastructural systems.

A novel influence on current green economic visions has been a wave of labor-environmental organizing that took off in the late 2000s under the framing of green collar jobs. The Apollo Alliance, Green for All, the Blue Green Coalition, and other organizing bodies helped broker alliances between US organized labor, Rust Belt cities, and other remnants of the Democratic Party's mid-twentieth century Keynesian base with environmental activists and environmental/economic justice organizers. Notable early expressions include Pinderhughes (2007), Apollo Alliance and Green for All (2008), and COWS (2008); Jones (2008) and UNEP (2009) helped make this regional advocacy visible on the national and international level. This organizing was fueled by the seriousness of the economic crisis and the political opening for left regrouping that it presented, particularly with the expiration of the second Bush Administration's term in office. But it had deeper roots.

Green collar jobs advocacy's vision of uniting divergent strands in the US left and Democratic Party establishment, including its mid-twentieth century base of industrial unions and environmental interests that rose in the party from the 1970s onward, had been pioneered in the late 1990s with resistance to US free trade policies (Cockburn, 2000).⁹ A crystallizing moment for much of this organization was 1999's anti-World Trade Organization (WTO) protests in Seattle. On an urban and regional level, ongoing innovative environmental justice campaigns like the East Bay Alliance for a Sustainable Economy (EBASE)'s Clean Ports Campaign (EBASE, 2013) has also contributed to these new kinds of blue-green organizing vision. However, the US left took an even profound hit with the election and post-9/11 ascendancy of the second Bush administration, with its massive "war-time" rollout of neoconservative ideology and military spending and its sustained attack on already-struggling unions and the federal environmental regulatory structure. As stated, the late 2000s financial collapse provided an opening for progressive and radical left reformation¹⁰ and a new wave of innovative blue-green organizing.

This organizing has mobilized the language of real economic growth and with it, US interests neglected and ravaged by three decades of neoliberal political rollout: environmental regulatory advocates, but also labor unions, and disinvested mid-twentieth century industrial regions like the Upper Midwest – on a finer grain, polluted and disinvested urban industrial places like West Oakland. Governmental abandonment of these Keynesian (embedded liberal) economic policies had, they argued, helped drive the US's growing racialized economic inequality. It had also contributed to the declining fortunes of the US's midcentury powerhouse industries and regions, notably the automobile industry and the Upper Midwest. As Markusen et al. (1991) argue, military Keynesian investment in the Sunbelt ("Gunbelt") helped actively produce the disinvestment that created the modern Rust Belt (see also Storper and Walker, 1989; Gilmore, 2007). The free trade rollout starting after World War II had helped create

industrial competitors and continued pressure for the United States to be national consumer of last resort also structured these regional industries' obsolescence and consumer debt burdens. The conditions would combine with capital mobility and US government-supported financialization to blow up the subprime bubble – as “asset-price Keynesianism” (Brenner, 2009) – and its collapse.

Correspondingly, this bloc called for renewed national attention to the real economy and domestic manufacturing, and for the redevelopment of national industrial policy (as opposed the US government's neoliberal era de facto military Keynesian and pro-finance programs). And its vision of employment in twenty-first century economic frontiers that would be available to non-professionals and provide steady, union-scale wages, as well as ameliorating unjustly racialized, classed exposure to industrial pollutants from existing sites of production. They thus united around the idea of economic growth, if economic growth of a certain kind, rather than conservation or overt protectionism (although, of course, the call for renewed US manufacturing contained important protectionist strands). They are forward-looking, even Promethean kinds of policies. Ambitious, expensive, interventionist, openly transformative, they are much more allied to early to mid twentieth century structure(s) of feeling, rather than embracing more limits-minded environmentalism. This organizing vision thus presented very modernist kind of coalition-building possibilities around the uniting force of a common interest in growth and economic transformation: green “creative destruction.” It opened a door for strategic rapprochement with cleantech interests and an ecologically modernist environmental mainstream more broadly (see Van Jones in Mirpuri et al., 2009).¹¹

Among the Obama Administration programs based upon this logic, critically featuring but not limited to ARRA, some of the most important include the following. The administration has provided new funding in the form of loans, loan guarantees, and tax credits, for a range of renewable energy, energy efficiency and building weatherization, and infrastructure retrofit programs, including Smart Grid proposals and high-speed rail projects. Notably, it established an advanced energy research agency modeled after the Defense Advanced Research Projects Agency (DARPA), ARPA-E (for energy). The administration's Energy Regional Innovation Cluster (E-RIC) adopted and ratified the regional economic cluster strategies that state and local economic development planners had long advocated. And programs like Cash for Clunkers and Cash for Caulkers/HomeStar – reconfigured as the smaller and slightly differently focused Better Buildings Initiative after Congress refused to ratify the earlier version, the green collar jobs initiative Recovery Via Retrofit, a project influenced by Van Jones during his brief tenure in the administration, and many other specific initiatives.¹² These programs encompass substantial public investment and other forms of active governmental support for the cleantech research and development that might support an energy-industrial transition, as well as clean energy and other green economic manufacturing jobs. They also encompass initiatives to open up federal public lands to renewable energy production (Cardwell, 2012).

Buildings in US Green Economic Development

Important parts of this green economic program centered around transforming buildings, building materials, and construction and development practice. Its vision has often encompassed mass market construction and homes, in addition to larger commercial campuses. In taking up these everyday forms of construction, and particularly homebuilding, for green “modernization,” it has engaged a sector that has been a major focus of US governmental efforts since the Progressive Era in the early twentieth century.

Reframing Weatherization for Economic Growth

As discussed at length in Chapter 1, the Obama Administration proposed the expansion of weatherization as a pathway to economic growth. However, the difficulties that this proposal encountered are illuminating. For example, achieving Davis-Bacon act compliance proved a significant early challenge, since administrators deemed that weatherization constituted a different kind of job than regular home construction and remodeling work (e.g., Tonn et al., 2011). Therefore, they would need to calculate prevailing wage rates for specifically weatherization work from scratch, and perform this analysis for all US counties receiving weatherization assistance. Given the magnitude of this task and the fiscally strapped situation of many of these places, it is thus unsurprising that the program’s rollout took longer than expected. However, an important question remaining for critical researchers is why precisely home construction work associated with weatherization constituted so very different a job than regular construction – particularly as the construction lobby had pushed for energy retrofit work precisely as a replacement for construction jobs lost after the collapse of the subprime bubble (e.g., NAHB, 2009; California Homebuilding Association, 2010). Although more research is needed, I suggest that the answer may lie in the underreported but serious deterioration of working conditions and wages in US residential construction, one that advanced during the neoliberal era and worsened during the 2000s residential building boom.

This legacy of 2000s era construction employment raises questions about current imagined pathways toward good green collar jobs, and perhaps sheds some light on why the federal government Davis-Bacon Act process so painstakingly distanced green collar weatherization jobs from existing residential construction work. Commentators like Ehrlich and Grabelsky (2005) and Fine et al. (2008) have noted the long decline of building trades unionization in residential construction (building trades unions have held on longer in commercial construction). They argue that by the time of the 2000s boom, the residential construction industry had radically de-unionized in regional construction markets nationwide. This fall in union density had been accompanied by a major decline in wages and in the desirability and perceived dignity of construction work. Later, as employers faced labor shortages in key markets, they ramped up their employment of undocumented workers, often under highly exploitive conditions (Bhatt, 2006, Palmer, 2006). These trends were particularly marked in the Sunbelt housing markets so significant to new construction during the era, and that later formed epicenters of post-subprime collapse distress. The irony of calls by the construction industry lobby to save these industry jobs presents itself: many of the workers who actually lost these jobs would not be eligible for rehiring as green collar jobs workers under the increased scrutiny of stimulus-funded programs.

Advanced Materials for a Green Economy

Looking toward longer-term green economic development, the administration also funded programs dedicated to innovation in advanced building materials and building science/design for high energy performance. It speculated on the export and technological super-profits creation potential of advanced building materials, design expertise, and other frontier green economic practice. This mission is of interest to green collar jobs advocates to the extent that successful advanced materials and appliance and building system manufacturing start-ups, or larger corporate expansions in these fields, may create working class jobs. Significantly, these contemporary initiatives resurrected past federal government efforts to “modernize” the US construction industry, most notably advanced during the same New Deal spatio-temporal fix that ushered in today’s fossil fuel-intensive landscapes. Current programs considered not just improved efficiencies or economies of scale in construction but also on the possibilities that introducing new materials and systems might create opportunities for domestic manufacturers.

For example, EERE (2012) cites the Home Performance Resource Center (2010) to argue for the manufacturing benefits of weatherization, stating that over 90% of the materials used to weatherize homes are produced in the US. According to Caperton et al. (2012):

The Weatherization Assistance Program not only created jobs desperately needed in the construction industry, it also provided a boost for American manufacturing and small businesses. More than 89 percent of the materials used in home retrofits are made right here in America...In all cases, except refrigerators (which are 62.3 percent domestically produced), retrofitting homes exceeded the national average for domestic share of all manufactured products used in the United States of 76.5 percent.

One arena of long-term development in energy efficiency has been the gradual upgrading of appliances meant for use in buildings, from small retail technologies like light bulbs and small appliances to larger-scale physical plant technologies for use in homes and various types of workplace (e.g., HVAC systems, refrigerators, water heaters, and washing machines).¹³ Manufacturers are also developing advanced building materials or prefabricated assembly components like high-performance windows. As discussed in Chapter 4, at the technological frontier they include active phase-change features that actively respond to environmental conditions. These active features join other bids to develop more extensive controls and building automation technologies, extending into “smart” building meant to interface with equally smart grids through real time energy monitoring devices – the controversial “smart meters.” These technologies generate big data for use by utilities and start-ups hoping to develop applications for consumers’ remote control of thermostats, utility load management, automated building adjustment to micro-fluctuations in weather and temperature, and other aspirations.

Pike (2012a) describes an expanding global field for energy efficient building materials that is dominated by large multinational corporations. Its enumeration of key global industry players in the residential sector surveys lighting manufacturers (Lithonia, TCP), major appliance makers (Electrolux/Frigidaire, Kenmore, LG Electronics, Samsung, Whirlpool/Maytag), makers of windows and doors (Andersen, JELD-WEN, Pella), insulation manufacturers (CertainTeed, Johns Manville, Owens Corning), and HVAC systems manufacturers (Carrier, GeoSystems, Geothermal International,

Goodman Manufacturing). Commercial real estate is being served by “whole building suppliers” like Retroficiency and Viridity Energy, and manufacturers like Trane (Ingersoll Rand), Carrier, and others are focusing on these buildings’ large system needs (Pike, 2012b). Considering green building materials more broadly, advanced materials include engineered timber, green roofs, stressed skin panels, frontier biologically-based materials, and new concrete applications like hollow core concrete, among other technologies; although at the other end of its neo-traditionalist-futurist spectrum green building is also opening up markets for traditional and local material suppliers. Pike Research (2013) estimates that the market globally for green construction materials was already \$116 billion in 2013; they project it to grow to more than \$254 billion by 2020. Once again, established multinational giants dominate its survey of key global suppliers of advanced green materials – BASF, DuPont, Interface, Lafarge, Owens Corning, PPG, and Saint-Gobain SA. However, it also lists a larger group of smaller businesses and high tech start-ups like ROCKWOOL International and SafeCrete.

As the Obama Administration sought to develop cleantech clusters, it quickly focused on these advanced materials and energy design and popularization and deployment as an arena for research and development. It initiated a competitive bidding process for an Energy Regional Innovation Cluster (E-RIC), part of a planned network of new green economic clusters (although it later scaled back these ambitions). This first cluster focused on energy-efficient building systems, creating an Energy Innovation Hub focused on developing these technologies and disseminating them within the local marketplace, creating public-private partnerships and advancing other regional economic development strategies. Philadelphia won the bid, creating an Energy Efficient Buildings Hub. Although not exclusively focused on energy efficiency or energy efficiency in buildings, ARPA-E also encompassed potential advanced technologies for buildings.

Less targeted ARRA funding included subsidies to energy retrofits in the form of tax credits (the Residential Energy Property Credit, Section 1121 and the Energy-Efficient Commercial Buildings Tax Deduction, among others) and Energy Efficiency and Conservation Block Grants (EECBGs), meant to be used by local governments in their own energy and climate initiatives. The administration unrolled other building energy efficiency programs with its Recovery Through Retrofit Initiative and, after some failed attempts (i.e., the HomeStar program), its Better Buildings Initiative. An initial fourteen “partners” in this public-private program to develop and mainstream high energy performance building techniques and materials included Citigroup, smaller financing ventures, Best Buy, and the City of Los Angeles, among others (White House, 2011). And the DOE (2010c) directly funded advanced energy efficiency technologies industries that again included larger multinational corporations.

The current wave of state support for energy and built environment innovation is the most recent expression of a longer US government interest in modernizing the country’s buildings, the built environment, and construction industry/process; although, of course, with an advancing and changing definition of what precisely constitutes the “modern”. An ongoing complaint about construction, particularly residential construction, is that it is inefficient, in an economic rather than energetic sense. Modernization advocates through the twentieth and now the twenty-first centuries have often called for innovations in the service of making potentially mass-produced buildings

like houses or small commercial buildings cheaper. I.e., they have attempted to make construction adhere more toward economically rationalized, technologically intensive factory models of high productivity manufacturing rather than more unruly combination of pre-fabrication and on-site production and assembly – and even maintenance of pre-modern techniques – that remain an important component of the building process (Hise, 1997; Harris and Buzzelli, 2002; Hassell et al., 2003). And they have made periodic calls to more or less fundamentally redesign buildings to accommodate new frontier technologies like modern plumbing, electrification and large home physical plants or factory fixed capital assemblies, and more recently the Internet and digital technologies.

The sector had seen moves towards consolidation in the nineteenth century. However, the New Deal marked an important intervention, although one with earlier roots in Progressive Era state organizing and Herbert Hoover's Chamber of Commerce (Walker, 1977; Loeb, 2011). The New Deal's state-facilitated industrial changing of the guard had another important dimension. Its spatio-temporal fix included not only large infrastructure but also a transformation in the design and construction of buildings, developments, and the broader urban landscape (Walker, 1977, Harvey, 2003). The intervention was meant to make homes cheaper, so that they could become a mass consumption product affordable to the (white) working class.¹⁴ These suburban home consumption suites constructed a critical domestic market for Third Industrial Revolution technologies and companies, and critically for the energy transition and intensification that they produced. New cheap "minimum home" designs helped consumers pay more for these extensive, technologically frontier physical plants and everyday technologies – modern kitchen and bathroom technology, an enclosed box for home heating and cooling, etc. Scholars including Walker (1977, 1981) Jackson (1985), Nye (1992), Hise (1997), and Weiss (2002) have tracked this process.¹⁵ And Tobey (1997), Cooper (2008), and Harris (2009) focus particularly on the important of New Deal home modernization and improvement loans in the 1930s. Before the wave of new construction began after World War II, they suggest that government had already substantially facilitated electrical modernization with the retrofit of existing homes for large electrical appliances, particularly refrigerators (over and above its rural electrification programs). Of course, a central irony today is that current energy modernization bids target and problematize precisely the energy and greenhouse gas emissions intensive landscape that this earlier wave of retrofitting and "modern" construction produced.

Public commissions since the New Deal have periodically attempted to work with construction interests to push construction farther toward factory prefabrication, the inclusion of particular new technologies – and indirectly toward a more consolidated industry model. The Department of Housing and Urban Development (HUD) has attempted to promote home affordability by lowering the cost of housing production, including high-profile failures like 1969's Operation Breakthrough:

This \$72 million research and technology development program sought to industrialize housing construction while also changing people's perceptions of manufactured housing. The main premise was that by replacing traditional, craft-based production processes with machines and precision manufacturing, mass-produced housing would be more consistent, higher quality, and more affordable. Despite its good intentions, Operation Breakthrough is widely recognized as being unsuccessful at promoting both technical and institutional change. Of the many analyses of Breakthrough's failures, perhaps the most enduring is that

Operation Breakthrough's top-down, federal approach was incompatible with the locally regulated and highly fragmented housing industry (Hassell et al., 2003, pp. 73-74).

These attempts to modernize construction and real estate development have characterized the industry as a chronic techno-organizational laggard. Despite the operations of major homebuilders like the Eichlers and Levitt in the midcentury suburban building boom and the continuing role of large suburban developers around major US urban areas in subsequent building waves critics argue that the homebuilding continued to be characterized by a large proportion of smaller regional developers and builders. More sympathetic critiques (e.g., Hassell et al., 2003) have blamed the oddities of buildings as such a large, expensive, and immovable manufacturing “product.”¹⁶ They also point out the punctuated nature of modern construction in places like the US, with much of the built environment laid out in periodic building cycles. This boom and bust pattern can work against large factory-style fixed capital production and investment in process or product innovation – and the large, consolidated construction and development companies necessary to capitalize such massive undertakings.

However, government programs remained focused on centralizing industry itself as a solution. Harris and Buzzelli (2002) argue that much of this research remains myopically focused on Fordist factory production as the model for all industrial production, ignoring both the rise of new awareness of the importance of more localized, distributed production networks in other industries (see Storper and Walker, 1989 for a review of this enriched discussion) and particularly the potentially adaptive role of small firm size and geographic fragmentation in such a historically volatile and localized industry.¹⁷ In addition, the importance of knowledge of land value trends – e.g., the local presence and knowledge that conveys ability to anticipate massive land value jumps as agricultural land is rezoned for suburban development (e.g., Walker, 1981), and that often require sitting on land for years and working to favorably sway local politicians – has worked to keep key parts of the industry local and disaggregated.

In more recent years, ongoing DOE energy efficiency research has also contributed to ongoing attempts to promote innovation in US housing. However, current state energy modernization supports represent the most profound reimagining of the technological-economic possibilities of the US built environment since the Progressive-New Deal era.

Harnessing Green Value for Economic Development

Critical sources of new value, resources, and economic surplus underlying these new industries include ideas of energy efficiency as a resource and a green premium in real estate. In other words, the success of the construction, development, and materials manufacturing industries in this sector may depend on the success of the value-finding and resource discovery processes outlined in the first part of this research. As discussed in the introduction to this part of the work, in their most ambitious articulations, green economic development visions unite environmental and industrial policy, as green accumulation strategies themselves increasingly challenge established boundaries between first and second nature (following Smith, 1984, 2003). These industrial state programs would theoretically open up core industrial processes, national infrastructure,

and urban built environments to an unprecedented degree of market environmentalist transformation.¹⁸ Internalizing environmental costs in fundamental sectors like energy and electricity should in theory unleash economy-wide effects and novel forms of creative destruction. It suggests a more thoroughgoing reconceptualization of what constitutes both “waste” and “resources” (Bridge, 2010). And critically for proponents of growth in the so-called real economy, turning loose environmental markets in these spheres should theoretically open up cleantech frontiers, engendering opportunities for more accumulation based on technological leadership and facilitating regional/national economic development and redevelopment based upon reinvestment of these technological rents.

However, if longer term economic development is on the table, we also must consider the geography of economic development. Models of geographic industrialization, i.e., how new value creation works in space and produces space, come up critically when talking about construction as a sector. A critical question here is whether construction can provide an economic base for a regional economy, through the successful production of exports and repatriation of the surplus derived from it or via some other pathway. If not, households and businesses will pay for energy efficiency retrofits, like other improvements to homes and buildings, out of preexisting surplus derived via some other means. These are basic questions of economic geography, and they come up again and again in trying to characterize building construction as an economic sector. However, we should recall how seldom they were asked of the subprime bubble: finance and the development industry blew up the housing sector by conjuring a surplus out of thin air, one that failed when the reality of increasing US mass economic insecurity confronted the promises of financial wizardry and other tactics.

Energy savings are one potential source of new value for a local economy. They constitute energy efficiency retrofits’ most important endogenous source of surplus – i.e., beyond the federal aid that weatherization channels to contractors, manufacturers, and other players in the retrofit industry. They constitute a stream of payments averted, and redirected from regional utility companies to local places.¹⁹ The likely future magnitude of energy efficiency as a resource, whether it is sizable enough to achieve all that has been hoped for it, is an open question. A key obstacle is the relative cheapness of energy, especially with lack of internalization of greenhouse gas emissions costs via climate policy. If this surplus proves insufficient, then the stable jobs argument for expanding weatherization might be unsound. In the current context, in which other key parts of the national manufacturing base is in decline and the labor accord is in shambles, the construction industry may have no particular pressure to improve the kinds of construction jobs it provided in the early 2000s bubble. Thus, construction jobs might provide temporary stimulus aid to unemployed workers but without supporting an urban or regional economy by themselves.

Another option for some places is the surplus derived from exporting advanced building materials. The potential for these exports has been promoted by the last wave of globalization, as it has facilitated cheap transportation globally of heavy intermediate goods and led to a more interconnected global construction market. Precedent exists for these extra-local exports going back to the nineteenth century in the US and Canada, as Sears Roebuck and other catalogs produced mail-order home kits. Prefabricated construction today has developed other export methods. New high tech cluster programs

in this sector promise to expand these possibilities. Successful exports of materials and expertise²⁰ from new energy efficiency innovations might provide the sort of regional economic surplus that the national government can redistribute nationally – although of course, the many urban regions that competed for cleantech cluster investment likely also did so in hopes of reaping the far greater regional surplus and knock-on economic development, real estate value booms, and so forth that Silicon Valley has enjoyed. Insofar as broader national energy retrofit programs provide a domestic field for economic-technological experimentation and an additional domestic market for the fruits of this development, the relationship between the advanced energy efficiency-building materials cluster(s) and the nation at large may be a productive and symbiotic one. However, it will still require some kind of export success if it is not to simply spend other sectors' surplus or appropriate parts of the existing energy utility market.

Financialization as Obstacle

Despite callbacks to New Deal and the Keynesian order in green economic development programs today, these policies are being developed in a very different kind of global economy. Particularly, I suggest that finance, in its ongoing power and the way that it shaped industries like commercial and residential development in the 2000s boom, presents under-recognized challenges to these programs. I unpack some of these difficulties in illustrations from US residential development during the 2000s and in advanced building materials production in the wake of the 2008 collapse.

Financialization in US Homebuilding

As discussed, previous state-sponsored building modernization programs, and especially homebuilding programs, have attempted to support centralization in the industry, framing fragmentation as obstacle to technological rationalization. These familiar perceptions of the residential construction industry as outdated and problematization of its fragmented nature emerge in current accounts like EERE (2008): “market fragmentation makes it difficult to address efficiency as most builders have a limited reach” (p. 13). These framings continue to valorize housebuilding industry centralization as the key to technological progress, in the model of the growing geographic centralization of large commercial construction – with potentially troubling consequences in the current moment given the nature of 2000s era centralization in the industry. In this context, a critically understudied part of the 2000s era building bubble has been its effect on the real estate development industry, particularly on homebuilding. Industry reports and emerging academic research suggest that the sector consolidated and centralized to an unprecedented extent during this period.²¹ However, they also show that speculative logics drove much of this consolidation, and that the financialization of the industry enabled it.

As discussed, massive homebuilders had succeeded during real estate booms in larger cities. Grebler (1973) and Walker and Heiman (1981) discuss a previous wave of consolidation in homebuilding. The long wave of construction coming of the 1960s had provided opportunities for sustained building activity. In addition, sparked by the late 1960s corporate conglomeration boom, companies like Alcoa, Kaiser-Aetna, and

Transamerica diversified into homebuilding operations. Grebler notes parallel trends in commercial real estate consolidation and multi-area operation (and Harris, 2010 briefly discusses the much earlier rise of national building materials suppliers in critical parts of construction; Abernathy et al., 2008 state that this upstream part of the industry consolidated still further during the 2000s). This wave of experimentation was short-lived, but an important lasting product of the time was the move by certain homebuilding companies to go public (Grebler, 1973), reducing their reliance on more localized commercial banks, savings and loans, and other regional financial institutions.

Frey (2003), Abernathy et al. (2004, 2012), Gertner (2005), Ambrose and Peek (2008), Caufield (2012, 2013), and other commentators on 2000s era consolidations note that companies that had gone public by the early 1990s had a key advantage over smaller builders still dependent on regional financial institutions. As savings and loans failed in the wake of the Savings and Loan crisis and early 1990s recession and commercial banks began to consolidate nationally, more locally embedded builders lost established financial relationships. In the new centralized financial context, large builders could get cheaper and more assured access to capital; public companies had still greater resources. The top 5-10 largest homebuilders maintained internal growth, but they critically grew via a wave of takeovers of smaller companies. They thereby acquired access both to these builders' local operations and their reserves of land – an increasingly valuable speculative commodity as large parcels in many exurban places grew less easily found and increasing regulation blocked or slowed the land entitlement process. Although deep-pocketed, patient land developers could still achieve great returns, the process took longer.

Surveying this trend, Abernathy et al. (2012) argue that developers' accumulation logic for this centralization had little to do with the kind of technological and productivity revolution that they had assumed to be driving and resulting from this 2000s-era homebuilding consolidation. Rather, these developers succeeded, the study suggests, because they acted more like financial and real estate speculators, centralizing the ability to profit off of large exurban land value increases and concentrating the surplus derived via these techniques.²² In other words (although the study itself does not explicitly make this point), they consolidated and centralized a surplus that had, as discussed, long accrued to more locally embedded land speculators and developers. Importantly, this logic speaks to both a history of massive land speculations in the United States and a huge rush on rural lands globally today.²³ Although more research is needed, the subprime crisis may have only furthered this trend. For example, after the collapse this select group of very large homebuilders moved to formally separate themselves from the rest of the builders represented by NAHB, hardening a split structure within the lobbying body (Palmer, 2013).

Some of these large developers, e.g., Pulte Homes, KB Homes, and Lennar, have in the wake of the crisis tried to establish their green credentials (Pike Research 2012a, Leon, 2011). They have joined other globally powerful commercial real estate industry actors like CB Richard Ellis and Jones Lang LaSalle that have marketed their green strategy (Pike Research 2012b), and financial players who are developing new strategies around green and energy efficiency financing. However, the aforementioned trends raise important questions about real estate industry's willingness and ability to use federal subsidies to effect significant transformations – as federal funding like ARRA runs out, and as the immediacy of the subprime collapse recedes. Particularly given real estate

developers' strategies for appropriating land and speculating large-scale on land value increases during the 2000s, we must closely examine the logic of real estate investment in green building today. We must query the extent to which property value-led development strategies will perform differently in a green economy than they did during the 2000s, particularly whether they can produce hoped-for real economic growth, investment in technological and practice improvements, provision of good working class jobs, and other hopes of a Green New Deal. This question has global relevance as large developers globally take up green marketing strategies and the World Bank pushes specialized green mortgage products for rapidly urbanizing cities worldwide.

Advanced Materials in a Global Economy

A significant omission in much of current debate on the Green New Deal has been the broader neoliberal political economic context in which these political visions are articulated and economic possibilities present themselves. This context is highly significant for green economic visions that emphasize a US manufacturing and manufacturing employment revival. Critiques like Block (2011), Hess (2012), and Mulvaney (2013) are starting dig deeper into this challenge, considering the structural features of the US economy that would-be green economic industries have inherited from the neoliberal era. As critics analyze economic policy more generally, they have charged that the Obama Administration and its programs have not done enough to reassert a US industrial policy, and one organized specifically around the green economy (Hess, 2012 presents an extensive survey of the many state and local green industrial policies that have continued throughout these fluctuations in national level policy). Their recommendations include making new political space for programs including domestic sourcing requirements; policies that require directly confronting the free trade rollout of the neoliberal era.

Some of the dangers here include the kind of capital impatience that has hindered the development of solar manufacturing in the US, as venture capital preferentially supports lower capital intensive information technology and free trade and free capital policies make investment increasingly footloose. These pressures, combined with ongoing problems in US property markets in the wake of the 2008 collapse, have challenged prospective building materials startups. Although more research is needed, the experience of Serious Materials, a company that served as an exemplar for how advanced material development was supposed to advance green collar jobs, provides an illustrative example. Building materials companies were in trouble following the collapse of the 2000s boom. Among stories of an industry in turmoil, a particularly newsgathering one was the decision of Chicago's Republic Windows to stop production and lay off workers, citing the collapsed market. Its United Electrical workers union local staged a sit-in strike to protest this decision that received national media attention. The outcome of this struggle was touted as a major green economic success story. In 2008, Serious Materials, a Silicon Valley-based cleantech start-up that had gotten its start manufacturing the zero-emissions and high energy efficiency drywall products EcoRock and ThermaRock announced that it would take over the factory and convert it from producing conventional windows to its new high performance windows (which included a specifically design series for weatherization assistance project installations), a strategy that saw the company commended by Obama.

However, although the start-up garnered considerable venture capital funding and won its bid to supply windows for New York City's high-profile retrofit of the Empire State Building, it quickly faced problems. In part, its troubles echo the broader difficulties experienced by large fixed-capital cleantech ventures in the United States; the company also had internal problems. But its issues also speak to a particular problem with real estate-targeted energy efficiency in the wake of the subprime collapse – that new energy efficiency interest did not always translate into sufficient retrofit and new construction business, particularly jobs requiring high-end advanced materials, to sustain these companies. Responding to these challenges, the company again laid workers off (ultimately those same rehired workers at Republic lost their jobs again, although in 2013 there was talk of a workers' cooperative in the making). And Serious Materials' executives repurposed much of their efforts, creating a new venture called Serious Energy that was meant to be an energy efficiency service company. Facing still more problems, they reorganized their efforts again to focus on energy efficiency retrofit *financing*, reestablishing the venture under the name Serious Capital. However, their efforts to flee to lighter and lighter footprint business models proved of no avail, and by 2013 they were selling off their component assets one by one; Serious Energy itself was bought by Trane (Ingersoll Rand) (Fehrenbacher, 2013). Although venture capitalists are still funding at least some energy efficient building materials companies (e.g., Cleantech Group, Inc., 2013), Serious' Materials high profile slide into financial services set a troubling precedent.

Inherited pressures of mobile finance capital in a global economy also manifest in ongoing pressure to offshore large fixed capital manufacturing. As discussed, the Obama Administration has promoted construction as a valuable sector because it is “non-outsourcable.” This framing acknowledges working class job outsourcing as a problem, a counter to rhetoric of post-industrialism ongoing even in green economic framings. However, it remains a relatively weak policy in that it does not directly confront the structural elements of US manufacturing decline and production transnationalization head-on. For example, following these logics, increasing ability to transport these materials profitably across US national markets also means that these materials are likely to be open to increasing competition from global manufacturers. These materials might indeed produce “green collar” jobs, but for another economy.

In this light, more research is needed on neoliberal era globalization in the building materials industry. The building materials sector had developed differently from much of construction in the United States in that it had been able to consolidate to a greater extent, even as early as the nineteenth century. As transportation and communications revolutions associated with globalization quickened and cheapened transportation, they opened up possibilities for transnationalization and consolidation in the industry. It is also probable that 2000s-era building booms in regions including East and South Asia and the Middle East changed the industry, including its strategies for accessing capital, in ways that have not yet been fully explored. It remains to be seen how much further consolidation and globalization of building materials might develop with the unprecedented ease and cheapness of transporting bulky goods. With freedom to export materials to any booming property market worldwide, the industry might overcome its traditional problem of dependence on particular places' building boom and bust cycles.

Toward a Conclusion

The Obama Administration's commitment to climate change mitigation has been challenged by environmental commentators charging that it did not do enough to support the passage of the Waxman-Markey climate change bill in 2009-2010; the proposed legislation died in 2010.²⁴ The administration has also been criticized for supporting unconventional fossil fuel booms in the United States and Canada.²⁵ However, the role of finance and financialization have been understudied here, even as fresh financial scandals and more general regulation attempts have received public attention. Existing critiques downplay a key obstacle that has so far critically hindered a Green New Deal, the ongoing power of finance capital. Although finance has faced problems of its own in the wake of the 2008 collapse, neither the Bush nor Obama Administration used massive bailouts or post-collapse inquiries to substantially restructure or discipline the industry.²⁶ Reconstituted banks have formed part of the green capital bloc that the Obama Administration counts as "partners" in its programs like the Better Buildings Initiative. They are highly unreliable ones, whose strictures both delimit state ambitions and compete with it to proffer divergent visions of US green capitalism. This tension about what deep-pocketed fractions or institutions are to act as the "brain" of capital in a time of turbulence – developmentalist states or financiers – marks a key difference from the relative weakness of finance versus states in the New Deal-Keynesian era.²⁷

Major transformations of the neoliberal era have included the massive growth of institutional investors and the financial industry in general, as both share of the US GDP and in absolute terms. Financialization has also encompassed investment banks' proliferation of complex, computationally intensive financial derivatives products, partially to serve an increasingly risk-differentiated fund market. It has also included the pervasive spread of financial logics and imperatives within everyday practice (Henwood, 1998; Gowan, 1999; Clark, 2000; Laulajainen, 2003; Krippner, 2005; Bryan and Rafferty, 2007; Lee et al., 2009; Wójcik, 2011, 2012).²⁸ And commentators like Ferguson (1995) have tracked the sector's rise within US national party politics, alleging capture of both major US political parties. Gowan (1999), Silver and Arrighi (2003), Harvey (2005), Brenner (2006, 2009), among others, have analyzed this financialization as deliberate (if worked out in fits and starts over time) US state economic policy after its industries lost global competitiveness, pursued multinational/transnational strategies, and faced tightening industrial competition and falling profitability overall (Brenner, 2006, 2009). US policies to support financialization included Nixon's delinking of the dollar from gold in 1971 (opening new currency exchanges and greater speculative opportunities in a far more volatile world monetary system),²⁹ the gradual rollback of capital controls internationally and of policies like Glass-Steagall domestically (repealed gradually between 1996 and 1999), the 2000 passage of the Commodity Futures Modernization Act, significant decreases in capital gains taxes, and the reworking of international development – via structural adjustment policies and other programs – to support the interests of lenders of national borrowers, among other interventions.

Governmental actors utilized these financialization policies to bolster the US's balance of payments (as the rise of industrial competitors weakened its balance of trade, while the country remained committed to its position as consumer of last resort) (Block,

1977; Eichengreen, 2008). And Wall Street gave Washington a tool for competitive devaluation abroad (Gowan, 1999; Harvey, 2003). But advocates also sold the rise of US finance as part of a broader secular shift towards a “post-industrial” economy, as discussed in Chapter 4. More concretely, a key front of neoliberal era financialization was the tightening of cost-benefit requirements for government spending – where the often libertarian populist politics of US tax austerity have met the “creditworthiness” disciplining of sovereign debt markets and global finance capital. Governmental programs have faced pressure for more rapid and certain return on public investments, a form of austerity that hinders long-term New Deal-style infrastructure spending and its “patient” capital requirements. I argue that financialization thus presents a critical problem for programs like twenty-first century energy transitions, ones that demand large amounts of capital, patient investment, and relatively long-term leaps of faith. I have argued that this tension between the government’s proposed new fixed capital investment and ongoing financial disciplining has contributed to cleantech’s well-publicized troubles in the last few years. Some of the most ambitious manufacturing-oriented cleantech start-ups in Silicon Valley and the San Francisco Bay Area have faced ongoing financing difficulties and an unsupportive context for expanding domestic industrial production, despite targeting for investment by ARRA. I argue the government has been unable or unwilling to depart too greatly from neoliberal era models that ceded much development responsibility to venture capital – and indirectly, to the broader ecosystem of finance of which it forms a part.³⁰

Coming out of the crisis, consolidation of market share and centralization of power within the financial industry has only grown. For example, the 10 largest banks now control over half of bank depositary assets in the system (up from 30 percent in the 1980s) (Davidoff, 2012).³¹ Although the lines between investment and commercial banks were further blurred in the aftermath of the collapse (i.e. with investment banks taken over by commercial banks or converted into bank holding companies), Wójcik (2011) suggests that this institutional change does not necessarily imply meaningful restructuring:

While commercial banks take over some investment banks, it does not necessarily imply less investment banking culture in finance. The last three decades have seen many commercial banks, including Citigroup, Deutsche Bank, Royal Bank of Scotland or Credit Suisse, permeated or even dominated by investment banking cultures, with traders and investment bankers becoming their executives. Second, bankruptcies of a few investment banks and securities firms may imply larger market shares for those left on the stage, whatever their legal format (Wojcik, 2011, p. 11).

These patterns raise serious concerns about the extent to which finance has retained its power to discipline the state: in other words, to continue to drive a system in which government power is employed as a tool to serve the financial sector than the other way around. This ideological and political capture is particularly serious when considering the US government’s ability to effect the transformations laid out in visions of a green economy. The US government at all levels has faced considerable pressures for austerity and related compulsions to rely on private finance to fund and direct frontier economic development. In the realm of the green economy and broader economic strategies around environmental change, finance thus acts as both a constraint on and potential competitor with the state.³²

Chapter 8: Urban Greening and Fiscal Financialization

This research has considered multiple dimensions through which United States federal government action is shaping green economic space in the contemporary moment, from its command over investment to its authority to structure formal economic space. Both powers are critical for the profound social and economic transformations needed to make a green economy work. However, the built environment-centered resource discovery and green economic development visions discussed here invoke another level of political authority and strategy, that of the urban. Urban governments depend on encompassing territorial powers to effect the most profound revaluations of greenhouse gas emissions and other new resources necessary to animate a green economy. However, cities are undertaking important efforts to green real estate and promote cleantech development, and to investigate whether and how these sectors can drive regional economic growth.

Cities have been made visible as drivers of climate change and sites for generating climate change solutions by a wave of global urban climate change activism, represented under the umbrellas of organizations like the C40 Cities and the Clinton Climate Initiative, the International Council for Local Environmental Initiatives (ICLEI), and the US Mayors Agreement on Climate Change. The World Bank, OECD, and other institutions increasingly treat cities as a vehicle for the dissemination of green building and financing schemes worldwide. And important cities in the US's federal structure are taking significant steps to shift metropolitan real estate markets. Cities are now partnering with financiers, developers, utility companies, and other actors to subsidize new green projects and experimental redevelopment and financing structures. And they are increasingly developing fiscal strategies that seek to harness frontier green forms of economic surplus and real estate value.

Better understanding this phenomenon, in the United States and in cities globally, is critical in tracking the unfolding of green real estate (re)development as a sector: it is one that remains deeply embedded in these urban and local political structures and political economic dynamics. And this investigation can help us critically analyze the work that green economic development strategies and rhetoric are doing: whether they are actually promoting transformative real economic growth or furthering unproductive financial speculation and accumulation by dispossession. Given the existing patterning of greenhouse gas emissions in the US and elsewhere – urban-sited practices account for a major share of existing emissions – cities will be key sites to track actually existing climate change mitigation progress and real economic transformation. At the same time, as historical sites of many real estate-financial bubbles and hearthplaces for many forms of neoliberalization (Peck and Tickell, 2002; Hackworth, 2007), urban centers provide particularly strong windows into emerging forms of financialization.

Exploring the aforementioned questions in the contemporary US urban context requires examining how city administrations, redevelopment agencies, and other municipal government institutions are taking up green property logics in their economic development and regulation functions. I suggest that previously discussed transformations in the production and market valuation of green real estate are shifting US cities' climate change mitigation strategies, and the logics through which they seek to parlay these urban sustainability initiatives into regional economic growth and recovery. I

argue further that these cities' strategies for green real estate development and retrofitting are increasingly being justified primarily on the power of newly established green value premiums to boost property values, rather than green construction's ability to grow infant local cleantech industries. I suggest that these property-led economic development strategies continue existing neoliberal era urban priorities and strategies, examining how new green fiscal instruments employ similar logics to tax-increment finance (TIF) vehicles and other urban redevelopment instruments whose use in the United States has boomed over the last thirty years.

I consider how city administrations and institutions may be driven to this kind of strategy by the weight of past policies. The urban expression of US neoliberal rollout has been a rollback of the federal government's midcentury Keynesian urban programs and the withdrawal of these policies' redistributive national investment. Harvey (1989), Leitner (1990) and subsequent analyses have tracked the "entrepreneurial" strategies that US cities increasingly adopted in response, as they competed for increasingly footloose capital (continuing a longer-term tradition of "booster" competition that was especially heated in the nineteenth century). However, as administrations competitively marketed cities via new economic (re)development ideas and attempted to lure new business investment with subsidies and capital projects, existing urban debt burdens and regulatory borrowing limitations posed an important obstacle. Cities across the United States were unable to use conventional municipal bond issues to cover these projects and increasingly turned to more exotic fiscal instruments and off-the-books borrowing practices, significantly increasing total debt burdens, making the degree and nature of this debt more opaque, and often tying debt repayment to speculative increases in urban real estate values.

Although Sbragia (1996) emphasizes how cities instrumentally used these practices to increase their freedom of action – her "politics of circumvention" – and policy mobilities scholarship has emphasized how urban politicians and trans-urban consultant networks spread them, I also consider this fiscal financialization as a field of financial industry market-making, and now a front in green finance. Financial industry players have performed an under-researched but key role in developing new fiscal instruments and in disseminating them to cities across the United States (and now beyond), as we can see for example from emerging research on investment banks' involvement in marketing 2000s-era interest rate swaps (IRSs) and other ultimately disastrous exotic products to city administrations, school districts, transit agencies, and other US urban institutions. Viewed from finance's perspective, these transformations in urban financing produced a host of new municipal bond market products with different characteristics. These markets perform an important investment function for pension funds and the other massive institutional investors that have become so powerful in the last forty years. Climate change and energy efficiency financing instruments join a sector that has seen ongoing turmoil in the wake of the 2008 collapse, and influential political entrepreneurs in cities like San Francisco and Chicago are now employing these green investment rationales in bids to more fundamentally transform twenty-first century urban finance.

I dig deeper into these urban political and financial industry strategies by examining how California, and particularly the San Francisco Bay Area, has become a generative site for experimental green fiscal instruments in the current moment. Over and

above the state's leading role in political experimentation around energy and environmental issues, its tax revolt legacy and continuing boom-bust economic and real estate experience make it an important place to study the workings of the politics of circumvention. California cities' experience also gives us a window into the complex ways that fiscal financialization can effect accumulation by dispossession – affecting not just absolutely disinvested regions and desperate urban administrations like Detroit or Harrisburg. Whether felt by relatively poor cities in wealthy metropolitan regions or even centers of capitalism/finance – here joining other rich cities with checkered histories of financialization like Chicago and New York City – fiscal experimentation and finance's speculative market-making have had complex geographies. In places marked by extremes of wealth and poverty, fiscal financialization in its new green variants seems to be abetting renewed gentrification and dispossessions and giving other California cities hope of accessing a transformed state fiscal system in the wake of massive changes to statewide redevelopment structures. Meanwhile, California (again joining Chicago and New York) continues its tradition of generating and “exporting” fiscal products to other cities across the US and beyond.

Urban Climate Change Mitigation and Green Economic Development

US urban governments are undertaking important efforts to promote green economic development, and to facilitate the kind of real estate-centric green/energy efficient construction and retrofitting programs discussed in this research. Although current attempts draw on earlier waves of US urban climate change activism, I argue that the rise of green economic ideas has impelled city institutions to alter their initiatives to take advantage of emerging possibilities for greenhouse gas emissions reduction to work for urban economic development or recovery. Cities are currently supporting a range of regional cleantech cluster generation promotions. Critically, they are also producing locally or adopting new instruments to finance energy and environmental real estate (re)development – taking advantage of the new capital interest and property value appreciation possibilities discussed in previous chapters.

US Urban Climate Activism

Scholars like Bulkeley and Betsill (2003), and Knuth (2010) have studied a history of US urban climate activism that predates the late 2000s rise of green economy framings. Part of the origins of this subnational policy activism in the US lies in longer-term struggles and evolutions in US federalism, and in frustrations with US national level gridlock on climate regulation (e.g., City of Seattle (2007).

However, the urban programs discussed here are also distinct in that they form part of a broader global urban movement being organized under the aegis of non-governmental institutions like the International Council for Local Environmental Initiatives (ICLEI) and more recently by international institutions like the World Bank. They constitute a network governance framing of responses to the problem of climate change that is distinct from parallel sub-national but large territorial state experimentation by California and other US states. Part of this urban imaginary comes out of late 1990s neoliberal “death of the nation state” assumptions – with more or less utopian ideas about

how the local level would be more tractable and less political. Simplistic framings that assume that because such a large share of total greenhouse gas emissions is produced in cities that these places actually have a locus of control over these emissions have often been frustrated. Even in federal systems like the US, cities are embedded in a more complex division of powers. However, commentaries like Davis (2010) underline the continuing importance of urban framings and right to the city movements, despite these problems.

Climate Change Mitigation in “Creative Cities”

Although the political framings discussed previously were important, urban climate programs are also more allied to economic development rationales and entrepreneurial urban marketing and competition strategies than has generally been acknowledged. Urban sustainability programs were important features of the new city branding options promoted by Richard Florida and other 2000s-era urban economic development gurus and consultants; they constituted one element of a checklist of policies that otherwise included more general aesthetic and cultural promotions. Florida and others drew on economically thriving models like the San Francisco Bay Area and arguments of US “post-industrial” comparative advantage to argue that these policy initiatives could attract new investment, population influxes, and employment. Urban cultural amenities including sustainability/environmental aesthetics were meant to demonstrate local competitive fitness for the location of creative industries like graphic design and other business services.

Commentators like Peck (2005) have roundly critiqued these policies for “creatives.” They argue against the assumption that successful application of these simplistic formulas could reverse the fortunes of economically disinvested regions – a critique that Florida has recently acknowledged in declarations that places like Youngstown, Ohio are beyond the pale as potential creative centers, even as marginal cities continue to pay consultants to come up with ways to salvage their increasingly threatened economic bases. And Peck has argued that the common feature often uniting successful creative class cities is that much of their actual economic base comes from their status as financial centers and the surplus that financialization has brought to the region. On the environmental side, an important critique is that these creative class policies may be more about urban branding and the appearance of pro-environmental action than substantial environmental transformation. Much like critiques of LEED certification, these policies are vulnerable to the charge of greenwashing. For example, it is difficult to determine what depth of sustainability policy actually “counts” for investors and how demanding they will be upon the realization of initial pro-environmental promises. Under creative class formulas, these measures only indirectly contributed to regional economic growth or recovery at best; attribution of success to specific urban programs was at best a hazy prospect. All these factors weighed against urban administrations undertaking truly deep and transformative climate change policies. Undertaking changes large enough to be disruptive – assuming cities had the formal authority to even do so; always a question when it comes to powers of economic regulation in a US context – would be economically counterproductive if it made cities less competitive to mobile capital.

These possibilities raise concerns when linked to critiques of existing urban climate change policy by Bulkeley and Betsill (2003), Knuth (2010), and others. These researchers found that many cities who accepted climate change mitigation commitments under ICLEI and other urban transnational schemes performed only shallow subsequent efforts to meet those targets. Some performed GHG emissions inventories and set concrete emissions baseline trajectories and reduction targets and timelines; others did not. Many quickly apprehended how extensive and often-intractable urban emissions can be: due to lack of formal authority at the urban scale, due to limited administrative resources without massive buy-in from the private sector or higher levels of government, due to basic lack of political will or willingness/ability to prioritize this unfamiliar arena of urban responsibility, or other obstacles. Some in response delimited their programs to urban buildings and other programs over which urban governments have more direct control – and for programs like energy efficiency retrofits may be able to claim cost savings and administrative economic efficiency improvements (attractive in a time of neoliberal fiscal austerity). But cities’ common experience of these obstacles created a culture in which noncompliance with stated climate change mitigation promises was implicitly endemic.¹

Urban Climate Action in the Green Economy

Green economy framings gave new life to urban climate change mitigation efforts, even in cities outside of unusually supportive territorial state contexts like California. The inrush of federal investment available to cities under the American Recovery and Reinvestment Act (ARRA) was an important impetus to new urban climate and energy programs, particularly coming as it did at a crisis context in which many cities were struggling. Cities qualified for both formula investment allocation and more competitive programs. According to ACEEE (2011), for some municipalities this money was the largest federal redistribution that they had ever seen.

With investment in green and cleantech the only economic development game in town, many cities promoted these programs as a new kind of frontier economic development. They took on this new framing with much the same logics as they had previously promoted “creative class” strategies. Urban economic development planners in the neoliberal era have passed around a changing bag of professional tools and tricks in formulaic economic development and rejuvenation programs, of which creative class ideas were merely the latest before the potential changes of the current moment. Cities fight for capital for stadiums and festival marketplaces to draw tourist dollars and to brand their cities, for conference centers to draw business travelers, for the broad array of infrastructure and cultural supports meant to attract the “creative class.” These programs have joined more longstanding industrial development programs like fights for regional transportation hubs and subsidies for companies to locate in particular places. All are meant to support local employment, tax revenues, and services; to give cities ongoing economic life in a system characterized by ever more rapid industrial-technological obsolescence and geographical creative destruction (at best; at worst, absolute disinvestment and shrinking cities – a phenomenon feared for years across the US Rust Belt).

Policies to attract cleantech have been an early twenty-first century addition to economic development planners’ toolkit, adding high tech and manufacturing elements to

urban climate change and sustainability programs that had previously focused on more cultural, mediated dimensions of greening as an element in a branding program. Cities are now fighting to become the site of federal innovation hubs. For example, in the first Obama Administration term, Philadelphia successfully won a bid to become the site of the Energy Regional Innovation Cluster dedicated to built environment energy efficiency; Akron, Ohio recently successfully competed to become the site of the first of planned manufacturing hubs under the administration's reworked Advanced Manufacturing program. Paradoxically, another major axis of US urban and regional economic development at the current moment has been the domestic revolution in unconventional fossil fuel production (fracking, oil shale, and tar sands), a wave of growth that has paid off in the repatriation of their surplus in urban fossil fuel industry centers like Houston. Of course, these policies might be more properly interpreted as the Obama Administration employing the existing federalist governmental hierarchy as a mode of national policy delivery, rather than as independent urban action. And the questionable durability of these places' efforts with the drying up of ARRA funds requires more research – questions have been raised about whether places had the personnel (particularly with crisis-era cutbacks) or expertise to take the new bureaucratic duties or areas of expertise required to use the available funds.

However, this investment and the new green economic framing were also influential for able and receptive cities in a potentially more durable sense. It gave urban administrations and agencies rationales for aligning climate change action much more directly to economic development, in ways that might even facilitate direct cost-benefit analyses, critical in a time of tightening urban austerity. Along these logics, it allowed even cities unprepared to make climate change pronouncements avenues for energy efficiency and cleantech promotion. Outside of more localized markets like real estate, acting on their US cities have limited power to shift markets – they are not generally large enough, and they lack the required economic authority. These limitations mean that they cannot alone create the kind of economic spaces necessary to create and protect new intangible commodities.

However, cities have important abilities to facilitate economic practices at the regional level, the generative scale that has been so important in world technological innovation history (and of course over a host of structuring circulatory systems necessary for the successful production and realization of commodities, from railroads to metropolitan road networks to container ports/intermodal transit hubs and air ports). And they can exert strong influences on real estate markets; indeed, urban land value has been a longstanding focus of urban politics and economic strategy. Some cities exerted these powers by undertaking cleantech cluster promotion strategies that employed the new green economic logics. These bids ranged they ranged from cleantech cluster proposals in Florida to Los Angeles' green corridor to completion and collaboration among East Bay cities of the San Francisco Bay Area - e.g., Cohen (2008), SPUR (2008), Redman (2009) (and see Dilworth and Stokes, 2012).

Cities typically initiated efforts by mapping out specific zones as cleantech clusters, often existing target areas for urban development. A typical subsequent urban strategy to promote these clusters was to attempt to link them to local universities in start-up incubator programs. Some made use of new federal grant programs like Energy Efficiency Community Block Grants (EECBG), although this source of funding has had a

generally troubled rollout. These programs echoed preexisting high tech promotion strategies, often attempts to replicate Silicon Valley's regional business culture as analyzed by Saxenian (1996) and others. These green permutations also extended to efforts to compete for ARRA programs funds (e.g., E-RIC) and subsequent federal cleantech investment programs.

Urban Green Real Estate and Fiscal Experimentation

Although cities have continued these industrial promotion strategies, a notable development in current urban green economic programs has been their focus on real estate development and retrofitting. In addition to partnerships with utilities in the kind of energy efficiency as a resource programs analyzed in previous chapters, cities have been particularly important promoters of the kind of green premium-based real estate strategies discussed in this work. The publication of green real estate premium numbers like those discussed in Chapter 5 and broader visions like McKinsey and Co. (2009) has allowed cities to begin to construct urban economic development instruments that draw directly on these speculative increases in land value. These strategies often involve partnering with financiers and developers to subsidize new green projects and experiment with new redevelopment and retrofit financing structures; urban institutions in these partnerships range from elected bodies to semi-private authorities and redevelopment agencies.

A critical late 2000s wave of urban green finance experimentation focused on the potential power of Property Assessed Clean Energy (PACE) financing models. For example, see Urban Land Institute (2010):

“Property Assessed Clean Energy (PACE)...allows private property owners to accept a voluntary priority tax lien on their property, which becomes the basis for a municipality to aggregate liens to issue bonds and provide capital to the lienholder to make energy efficiency or clean energy improvements to the property....in 2010, DOE's competitive grant cycle under the Energy Efficiency Community Block Program allocated \$150 million to support these programs across the country. Many states, counties, and municipalities have passed enabling legislation, and a small number have stood up early lending programs. The most notable examples of existing programs are Sonoma County, California; Boulder, Colorado; Palm Desert, California; and Babylon, New York.”

Fuller et al. (2009) present an introduction to energy efficiency and renewable energy financing districts for local governments that includes an explication of how PACE districts function as special governmental districts. In California, the rule-making is slightly variable between differently classified kinds of local governmental entities, but PACE is enabled by Progressive Era authority allowing special districts and variations on Mello-Roos bonding power. The oddity of PACE districts is that they take on the non-geographic redistribution ideas that Einhorn (2001) discusses to an extreme degree. Regular special districts are for some kind of collective project – e.g., infrastructure shared by a subdivision, or a special assessment on property owners along the course of a sewer or water line extension. PACE districts have typically been coterminous with the governmental jurisdiction of the local entity issuing them. However, the proposed benefits from PACE have no such local geography. They either redound on scales like the utility jurisdiction (via the logic of energy saved via demand-side management (DSM) programs), the planetary (for greenhouse gas emissions reduced), or the highly individual (in household energy saved and potential increases in or protection of property

value). The major overflow from these projects might be the household's economic surplus from energy savings or progress toward a city's overall GHG reduction goal, but these benefits are quite fuzzy compared to the usual monetary logic of modern special districts like tax-increment finance (TIF).

Cities' experience with residential PACE programs has so far been disappointed in a context of ongoing foreclosures and regulator wariness. Instead, many have turned to commercial sector partnerships:

Many states have targeted the residential markets with their programs, bringing considerable attention to the issue of debt seniority in the context of residential mortgage securitization. Fannie Mae and Freddie Mac have stated that they will not buy any mortgage with a PACE lien in a priority position over the first or second mortgage. This has effectively brought most PACE programs to a halt and has directed attention to potential federal legislation that would address this impasse...a number of municipalities continue to develop PACE programs with the intent to focus on the commercial real estate sector, which currently requires that lender consent be obtained to place the tax lien. Additional variations of PACE include "owner-initiated" models, which allow single owners of multiple real estate assets to work with the local jurisdiction on a single bond issuance and bypass the lien aggregation process (Urban Land Institute, 2010).

Schemes today include a range of public-private financing arrangements between local governments and third party green financing ventures like Renewable Funding or Ygrene. In California, some important ones include GreenFinanceSF (part of the Energy Upgrade California program) and Clean Energy Sacramento, among many other proposals in the state and elsewhere. Critical analysis must continue to consider these instruments along the lines of Graham and Marvin's (2001) discussion of urban fragmentation, particularly if access to these public resources continues to be highly skewed toward "creditworthy" borrowers, a major stipulation/need of financing ventures that market these instruments.

Entrepreneurial Cities and the Politics of Circumvention

How should we interpret this phenomenon? A critical consideration here is the extent to which this kind of property-led economic development strategy represents a continuity with the evolution of US urban strategy during the neoliberal era. In a context of decreased intragovernmental redistribution, otherwise heightened urban austerity pressures (e.g., due to regional disinvestment), and the urban competition for footloose capital compelled by financialization (Harvey, 1989; Leitner, 1990; Peck and Tickell, 2002; Hackworth, 2007), cities attempted more experimental financing methods, helped by willing financial sector players. It is important to consider how these policies may exert path dependence on proposed green strategies, particularly if cities apprehend that as ARRA funds dry up they are likely to be forced into greater reliance on private finance for transformative amounts of capital – always assuming that these are not forthcoming from a more profound shift in federal government redistribution.

Entrepreneurial Cities

Critical scholars like Harvey (1989) and Leitner (1990) have described how this withdrawal of federal funds heightened cities' need for private capital and the intensity with which they competed with other metropolitan areas for this increasingly mobile investment, fueling the kind of creative industry urban branding attempts described above, along with a broader suite of economic development trends taken up and disseminated by many cities— e.g., building convention centers or stadiums, sponsoring sports teams, subsidizing mixed-used downtown redevelopments and “festival marketplaces,” among other promotional projects, as discussed above. On the urban promotional end, these supports also include city-funded tax write-offs and other subsidies meant to lure industry into particular cities.

This heightened competition also helped fuel cities' focus on real estate-led growth strategies, as analyzed by Schrag (2004[1998]), Fulton (1999), Weber (2002, 2010), Ashton et al. (2012), and Pacewicz (2012), among others. They have often been characterized by property value-led development. Booster coalitions have been active throughout US urban history, pursuing urban growth machine strategy that often promoted downtown redevelopment and real estate value defense/speculation (e.g., Hartman 2002; Self, 2003, Logan and Molotch, 2007 [1987]). However, during the midcentury Keynesian period beginning especially with the New Deal downtown property interests competed for federal urban renewal funding and other public investment as much as private capital (e.g., Sbragia, 1996).

Cities' reliance on speculative increases in property value and on private capital to provide that investment increased apace in the neoliberal period, with some cities becoming increasingly reliant on property bubble-tied mechanisms to fund basic urban services. Subsidies during this period often included urban renewal's traditional practice of eminent domain and city-funded write-downs of urban property value to make downtown location cheaper for prospective inhabitants. Weber (2010), Ashton et al. (2012), Pacewicz (2012), and other scholars of fiscal financialization have described the role of redevelopment agencies and their fiscal instruments in financing these capital projects and broader urban entrepreneurial efforts, and the growing role of redevelopment agencies in keeping entire urban administrations running in broader ways. They consider particular financial instruments and geographic districts like tax-increment finance (TIF) whose use by cities has grown rapidly during the last thirty years. (Sbragia, 1983 and Johnson, 1999 describe how TIF became a basic tool for redevelopment agencies nationwide after California majorly expanded its use in an attempt to try to escape its Proposition 13-induced budgetary woes.) See Frieden and Sagalyn, 1991 for an example of what redevelopment agencies' property value write-downs, creation of TIF districts, and retrieval – or not – of an increase in property value as a result of this redevelopment looks like from the commercial development side.

Of course, these land value rise-tied tools also continue a longer tradition in the business of US suburban land development (Walker, 1981) and urban gentrification (Smith, 2001; Hackworth, 2007), property development models now being employed for spectacular urbanization bids in other economically booming cities worldwide (e.g., Goldman, 2011). See e.g., Strickland (2013) on the mobilities of these policies, a financial variant on McCann and Ward (2012)'s broader discussion of the new globalized context for urban development and competition. Torrance (2009a, 2009b) discusses the

emerging global financial markets being created by these urban strategies. Schrag (2004 [1998]) and Fulton (1999) focus on the importance of redevelopment in the context of California's particularly intractable fiscal context post Proposition 13.

The Politics of Circumvention

In interpreting cities' growing reliance on TIF and other exotic fiscal instruments – as well as more recent green financing vehicles like PACE, we must consider another dimension in which the weight of past practices constrains cities' current options and tactics. As Weiss (1991), Sbragia (1996), Scobey (2003) and others have discussed, US government policies have often played an important role in blowing up speculative real estate booms – and thus constitute an significant factor in the boom-bust patterns and discontinuous waves of growth that have characterized US city-building. Cities have facilitated these speculative bubbles via some of the capital spending instruments policies described above. Sbragia (1996) and Weiss (1991) focus specifically on these fiscal political dimensions of real estate boom-bust cycles. They present a picture of capital spending-boosted (and more or less debt-fueled) urbanization and real estate speculation during boom periods, followed by fiscal distress and public or top-down austerity compulsions during the bust.

According to Sbragia, this recurrent dynamic has over the last 150 years produced a growing complexification in US fiscal federalism. In the busts that have so often followed these booms, cities have often gotten burned, liable for debt like they cannot pay off. With Sbragia, historical analyses by Teaford (1984), McDonald (1986), Einhorn (2001), and Scobey (2003) centrally focus on or perceptively discuss specific historic cases of how real estate boom-and-bust cycles have played out in US urban and federal fiscal politics. Often, they track the same kind of dynamics of capital spending-boosted (and more or less debt-fueled) urbanization and real estate speculation during boom periods, followed by fiscal distress and public or top-down austerity compulsions during the bust. They establish a long US urban history of this problem, with city administrations facing large debt repayment burdens and an outraged citizenry. The structural post-collapse response time and again has been the imposition of borrowing limitations, public approval processes, and other effective austerity policies (Weiss, 1991).

Sbragia (1996) describes the tactics that cities have used to deal with these austerity policies over time as the “politics of circumvention.” She argues that the typically punctuated nature of US urbanization waves means that real estate developers and city governments typically have time for the memories of previous bubbles to recede; indeed, that this forgetting is a constituent element permitting new speculative fevers. However, crisis-era austerity policies are not so easy to expunge – they typically endure as elements of regulatory codes and legal geographies. She argues that urban growth machines and economic development authorities eager to boom incipient real estate and urban development activity after the memory of these troubles has faded have historically faced difficulty confronting head on the structural consequences of past boom/bubble collapses – i.e., spending and debt limitations, regulatory stipulations for public approval of governmental debt issuance, etc.

She argues that a key enabling element in successive new booms has been for urban governments to come up with loopholes and work-arounds in these existing laws

that allow them to legally – and often surreptitiously – assume new debt burdens despite them. This logic of circumvention is necessary, she argues, because taking on these regulatory obstacles head-on has generally been too politically costly and expensive for urban administrations. Instead, she argues, politicians have sought out new kinds of fiscal instruments that satisfy the letter of these laws even as they violate them in practice – often by taking on public debt that is not formally classified as debt; because it is siloed within the separate bonding purview of a public authority or because it supposedly pays for itself out of project revenue created. Variations on the latter logic have been the basis for many revenue bond types created in the last fifty plus years.

Teaford (1984), McDonald (1986), Einhorn (2001), and Scobey (2003) present historical analyses that allow us to piece together the employment of this tactic over time. Together, they establish a picture of how the US fiscal system and its raft of bonding instruments, special funding districts, debt limitation structures, and intra-governmental redistribution structures evolved up through the Progressive Era. Sbragia (1983, 1996), Caro (1975), Fulton (1999), Johnson (1999), and Weber (2002) fill out the twentieth century picture. They consider the growth of public authorities and other opaque governmental units like special districts, and the revenue bonds that replaced older general obligation bonds as their tools of choice (e.g., Moses' creation of revenue bonds backed by bridge tolls, or the Mello-Roos "dirt bonds" often used to finance suburban infrastructure construction). As the last section of this chapter will describe, in the late 1970s California became a particularly influential poster child this fiscal complexification tactic, as California cities' long boom in property values produced its own problems for property owners and, ultimately, the constituency that would animate the tax revolt – a key moment in the birth of modern neoliberalism.

Critically, we should note that these work-around strategies have often involved the creation of new municipal debt markets and financial instruments. The historical progression started with direct tax payments and traditional voter approval-required general obligation municipal bonds; the politics of circumvention pioneered many new types of urban debt. Einhorn, MacDonald, and others describe the highly privatized/localized form of urban improvement financing known as special districts, often undertaken in the aftermath of particularly pronounced budgetary crises – and seeing new life today, as their enabling legislation has formed the basis for some kinds of green instruments like PACE.² Caro and others describe New Deal-era innovations that centrally included the interrelated creation of the public authorities form – one with considerable shielding from direct popular voter approvals³ – and the revenue bond. Revenue bonds are tied to assumed future income from a current investment and have formed the basic model for many subsequent experimental fiscal instruments. More recent types of fiscal innovations include TIF districts and the redevelopment agencies that employ them so influentially. Again, we should note the growing importance of speculative real estate value increases in providing the revenue to service these debts.

The specific loophole that each instrument has come to exploit over time varies – and can vary by place, as these instruments often require the passage of state-level enabling legislation. However, they are united in that the financing that cities are able to undertake with them is shielded from the need for stringent popular votes, protecting urban projects variously from austerity-minded tax hawks and environmentalist slow growth advocates. As commentators like Mike Davis have pointed out (Davis, 1990) and

more recent libertarian populist critiques have bemoaned, conventional political party lines and official platforms often blur at this scale. Some Republicans fight to save their jurisdictions' borrowing power, while left environmental groups can fight to block governments' spending ability (more on this confluence below). And these strategies are united in the way they allow urban governments – and urban governments of a variety of types – to take on additional debt. Often they do this by not formally classifying this borrowing as debt, even as it draws from the same sources of revenue that would otherwise be used for debt repayment. And often they work in highly opaque ways, meaning that separately, and even more so in aggregate, they make the total amount and nature of urban debt difficult to ascertain. Thus, much US local debt is now off-the-books and not subject to popular vote, and is often not represented in municipal governments' overall credit ratings, even as it effectively if not formally compromises their ability to continue borrowing to finance growth.

This “shadow” debt system has raised increasing concern and has faced political challenge at several important instances in recent years. In one important challenge that the next section will discuss further, the tax-exemption of municipal bonds was successfully legally challenged, although that challenge has not yet been acted upon. This move was a response to cities' use of private activity bonds. And it has provoked a renewed wave of critique in the wake of the subprime crisis. The capacity for financial circumvention of spending and formal debt limitations that Sbragia analyzes has expanded greatly with the neoliberal growth and regulatory unleashing of the US financial industry. A wave of exotic financial speculation came out of the subprime boom that ultimately proved highly exploitive for urban borrowers. E.g., see BondGraham (2012a, 2012b), Morgenstern, Gretchen (2012), The Pennsylvania Budget and Policy Center (2012), Refund Transit Coalition (2012), State Budget Crisis Task Force (2012).

In the abstract sense, this shadow fiscal debt structure parallels the equally opaque and extensive debt structures undertaken by private actors as a result of subprime lending practices and their subsequent on-selling to secondary markets, aggregation as asset-based productions, tranching, and other financial manipulations and market complexification. And this comparison also calls attention to the US's broader patterns of regional disinvestment; and, conversely, financial speculation and gentrification in more favored cities and regions. Much as these structural inequalities and generally increasing economic insecurity for many ultimately undermined the realization of subprime loans – a failure of effective demand – and now compromise the private sector adoption of green practices, the fiscal dimensions of these trends have joined explicit austerity policies in impelling urban circumvention/financialization policies. Cities desperate for economic recovery even before the 2008 financial collapse have been an important source of demand for exotic finance. To the extent that these investments failed to bear fruit as the 2000s property bubble collapsed, we must seriously question their utility.

The Politics of Circumvention in California

Analyzing patterns of fiscal financialization outlines the role of particular places as sites for generating and disseminating financial instruments and practices. Both the generation of these policies in particularly hearthplaces and their subsequent mobilities across the US (and abroad) tells us important things. Commentators often point to Chicago and its spread of swaps and other instruments as playing this hearthplace role. I suggest here that

California, and particularly the San Francisco Bay Area, are currently important sites for this particular kind of financial policy mobility/market creation; particularly the kind of experiment green fiscal instruments of primary interest here. Previously discussed energy efficiency as a resource and green premium-back instruments like property assessed clean energy (PACE) projects can be thought of as much as local government programs as a real estate one; California has been a hearthplace of both green real estate development and these public-private financing vehicles. Important green financing instruments like PACE financing were generated in the Bay Area. These particular instruments were generated out of the Berkeley Mayor's Office as part of the city's climate change mitigation plan efforts. Other California cities were important adopters of this initial wave of PACE experimentation. It is also notable that the instrument was very rapidly spread elsewhere in the US, as cities took it up and a variety of states began to pass the required enabling legislation. (The Obama Administration also promoted the instrument via ARRA funding, as discussed.)

Although the state's history of leadership in environmental policy and experimentation with energy delivery forms have been important factors in the region's role as a hearthplace of current financing experimentation and dissemination, I argue that its history as a particularly intense site of capital booms-busts and austerity policies have been equally important. I argue that their role as epicenters of financial bubbles and financialization has made them simultaneously often places of high-risk tactics and creditworthiness consequences, even as their strong economies continue to make them places attractive to and in need of financing for growth/transformation. This is important context for their need for unconventional finance and the financial industry's interest in helping them obtain it.

The state's urbanization history has been notable for its boom-bust economic cycles and speculative real estate booms and bubbles (e.g., Fulton, 1999; Walker, 2006; Bardhan and Walker, 2011). In modern California history, this experience helped make the city's residents a responsive constituency for the tax revolt, encoded stubbornly in state law in 1978's Proposition 13 and subsequent statutes. The tax revolt itself was an important moment of California as a generative site for policies elsewhere, as similar kinds of property tax limitation policies spread across the federal system (Sbragia, 1983; Johnson, 1999). And the particularly stubborn tax limitation restrictions encoded in Proposition 13 and its addenda have made California a particularly strong site for the politics of circumvention. Over the past thirty years, the state has simultaneously demonstrated considerable fiscal brittleness and intractable conditions and booms that quickly follow busts and near-fiscal collapses. In this context, even indebted cities have often felt like they had to undertake new investment to jump on the newest wave of growth, while prevented from using any conventional instruments to do so. Yet despite cities' often-shaky finances, the state has remained an economic powerhouse, an attractive site for financial experimenters to put the time in to come up with new kinds of exotic financial products to "help" cities take on more debt (a different context than would likely face a more absolutely disinvested region, rather than this volatile and unstable one). Indeed, as we will see they could often expect high returns out of the ostensible risky involved, while having an idea about what might actually be less risky than cities' creditworthiness problems would suggest. We can importantly see the results of this collision of circumstances in California cities' pioneering use of redevelopment

agencies and TIF finance to perform a wide variety of urban functions. We can see a history of experimentation with other instruments as well – fiscal zoning (Fulton, 1999), speculative financing for prison construction (Gilmore, 2007), interest rate swaps as early as the 1990s (BondGraham, 2012). In the current moment, green instruments' appeal as off-the-book vehicles is obvious in California.

Beyond the Politics of Circumvention?

This past experience raises a risk that we must examine further. Both the green economy's short-term results and long-term prospects are under considerable scrutiny by embattled government agencies anxious to make the cost-benefit calculations on their economic development spending pencil out and to leverage public expenditures with large private sector investment. These pressures shape cities' current emphasis on these urban land value-boosting programs and should be evaluated within a longer US fiscal context. Attempting new economic development programs – particularly as potentially radically new as regionalized cleantech development – is a difficult task in this tough fiscal environment. Paying for retrofit and infrastructure redevelopment programs – and, given the numbers thrown around by institutions like McKinsey and Co. (2009), truly massive programs – will not come cheaply. Compounding the political intractability of big new government spending programs in a fiscally strapped environment and a time of highly politicized tax resistance, many governments' ability to take on new debt has been constrained by their ongoing financial troubles and legal prohibitions from taking on new debt (and financiers' new wariness about the once-unquestionable creditworthiness of US municipal bonds).

In this context of places' deeply felt need for new economic rejuvenation and in the crisis, barriers to new spending or conventional debt accumulation (Peck, 2012, 2013), and the emergence of economic ideas that can bill themselves as game-changing and novel (i.e., cleantech in a radically changed twenty-first century energy and environmental context), cities are potentially expanding their circumvention strategies using new green financing instruments. This wave of interest in new green finance includes the PACE instruments review above. And these frontier urban green/carbon financing initiatives in US cities have been joined by a raft of proposals from major international development institutions – see World Bank (2010), Della Croce et al. (2011), Merk et al. (2012). The World Bank is now actively pursuing green mortgage lending globally. A critical question is how the special district forms and other structures discussed here have the ability to go off-the-books. New green strategies' may go off balance sheet in new ways – some about new value, some just about new unregulated sphere for fiscal complexification (newest frontier among many).

Other greening proposals seem to throw out the politics of circumvention altogether, mobilizing the crisis to make more sweeping changes to urban fiscal structure. A particularly important 2010s development has been Jerry Brown's dismantling of the structure of redevelopment agencies (and their TIF financial instruments) in California, with a proposal (SB 1) potentially in the works to build a new redevelopment-like structure whose operation would be much more tied to objectives of the state's climate change planning legislation (SB 375). Although considerable uncertainty still exists about what structures will replace redevelopment in California, the stage looks set for new climate and energy priorities and green economic development/financing instruments to

play a much greater role. Similarly, energy efficiency was a marquee project of Rahm Emmanuel's creation of an infrastructure trust in Chicago. However, developments so far indicate that these proposals may simply be opening a new green financing chapter in these places' troubled history of fiscal financialization (e.g., Fulton, 1999; Weber, 2010; Ashton et al., 2012).

Ongoing critical scholarship must examine the extent to which these experimental fiscal instruments are joining private vehicles in attempting to capitalize the value of new commodities into urban real estate values and markets. And we must analyze how new green property policies risk promoting the growth of bubbles instead of real economic growth, and that in the process may leave cities further indebted, less resilient to future needs or course changes. Of course, this is one of the key arenas in which a more thorough and durable post-ARRA program of public investment might begin to reverse some particularly damaging political economic trends associated with neoliberalism. As return to more redistributive policies might blunt the ferocity of competition between cities, delimit the most speculative financial activities involved here, and direct cities' attention more towards real economic growth than the blowing up of property bubbles.

How Finance “Sees” Cities

Although Sbragia (1996) implicitly treats the development of fiscal austerity policies and deepening urban financialization as dialectical processes, she generally emphasizes how cities instrumentally used these practices, including partnerships with financial industry actors, to increase their freedom of action – a line very different from Hackworth (2007) (and Sbragia, 1983) and more recent commentators who have criticized these practices for increasing the financial industry's power to “discipline” cities, impelling drawbacks in social welfare policies and promoting short-term speculation over more durable economic growth. Despite their sharper critiques along these lines, contemporary policy mobility scholars like McCann and Ward (2012) and Strickland (2013) implicitly take up elements of Sbragia's line by treating urban policymakers, consultants, and other entities in the political sphere as the primary actors relevant for studying the generation, dissemination, and change of these kind of experimental urban tools and ideas.⁴ I argue that when the tools involved are financial instruments, that we must pay stronger attention to analyzing these patterns from financial industry side – one networks of urban policy dissemination can equally be fields of market-making promoted by investment bank actors.

Municipal Bond Markets in Flux

Viewed from finance, the politics of circumvention has manifested in an explosion of different urban borrowing entities and types of debt instrument – again from general municipal bonds to revenue bonds to various forms of revenue bond.

This explosion of bonds has performed a generally useful function for the needs of institutional investors like pension funds. As these institutional investors have risen in size and importance in the last thirty years and expanded geographically beyond their original centers in the Anglo-American financial system, they have been a hungry market for stable instruments. And, of course, their growth has also been linked to the increasing

large and quantitatively armed community of investment banks and other entities motivated to develop increasingly many and increasingly complex types of fiscal instrument for these funds.

As other researchers have chronicled, these funds' diversified hunger for secure and higher-return instruments were an important factor in the blowup of the subprime crisis in the United States – pension funds and insurance funds were important buyers of mortgage-backed securities (MBSs) and the other asset-backed securities (ABSs) that were novel products of the last few decades of financial experimentation. In the wake of the collapse of these instruments (at least for the present) as a source of accumulation, institutional investors are considering new local state and infrastructure products. These funds' interest in municipal bonds often stemmed from the supposed stability of returns from US municipal bond investments (itself a historical political product of a major austerity moment, as Sbragia, 1996, discusses). However, different instruments have slightly different characteristics, which is useful for investors. Converging trends developing before the current ongoing period of turmoil and newly arising in this period of increased insecurity and volatility have pushed the financial industry towards an expanded conception of the role that municipal finance could play in twenty-first century accumulation strategies. Long considered a secure but relatively sedate and low-profit area of the financial system, municipal finance in the United States and more globally is becoming a more geographically extensive, riskier, and more profitable sector.

We should note here that municipal bonds have been traditionally of most interest to wealthy individuals. With low rates of return on investment relative to outlets perceived to be higher risk, municipal bonds have typically made the difference up to investors via their tax-exempt status (an indirect intragovernmental subsidy). Only national investors benefit from this promotional feature, and one which investors investing in their own states and localities can compound with exemptions from state and local taxes. Investors explored the possibilities of higher-yield debt from cities (i.e. riskier, and demanding higher interest rates from urban borrowers); they have also increasingly chafed at the way the return structure for US municipal bond markets is geographically embedded – a relic of an era in which local urban elites invested in urban growth machines in cities across the US (e.g., Harvey, 1982). As this capital has fled many US regions, the geography of willing wealthy investors and cities in need of funds has diverged. And the global capital looking for safe havens in US sovereign debt and asset-backed securities was barred from profitable investment at the US sub-sovereign debt level – without tax exemptions, returns would be so low as to discourage all but the most desperate forms of capital flight investors. The rise of BRIC countries is prompting investors to take an increasing interest in the worldwide potential of subnational bond markets potentially diverting capital away from ongoing US investment.

Patterns of fiscal financialization during the subprime crisis give us a better window into how financial industry actors in search of higher yields marketed more exotic and higher return fiscal instruments to different urban and local government actors, and the potentially damaging implications of this trend. This latest iteration of fiscal financialization saw many cities taking on ultimately disastrous interest-rate swaps (IRSs), boutique financial arrangements with investment banks that allowed them to control and cut interest rates during a boom; i.e., a time in which many cities' demand for financing might drive rates up. As that boom quickly proved a bubble and the federal

government embarked upon a new round of quantitative easing (repeating a past policy employed during the mid-1990s recession and again at the beginning of the 2000s) (e.g., Brenner, 2009), the terms of the agreement saw cities paying interest rates to investment banks exorbitant by new market standards. This experience has provoked widespread protest, exacerbated by news of investment banks' collusion in manipulating the LIBOR rate that served as a baseline for constructing many of these deals.

Analyses like BondGraham (2012a, 2012b), Morgenstern, Gretchen (2012), The Pennsylvania Budget and Policy Center (2012), Refund Transit Coalition (2012), and State Budget Crisis Task Force (2012) make it clear that financiers actively marketed these policies to often-unsophisticated financing populations like school districts. As with subprime loans, sophisticated financial actors sold these policies to cities via the justifications of a quantitatively sophisticated financial industry delivering superior products out of its heightened ability to manage risk; urban governments often took on these instruments without completed understanding them. These waves of marketing often followed key pieces of enabling legislation (e.g., in Pennsylvania, opening up school districts to these deals). Adapting a broader point on the importance of territorial legal geography from Chapter 4, this pattern indicates that policy mobilities theory should pay more attention to how existing accretionary legal geographies shape that spread, particularly in the context of finance where so much of the value proposition depends upon legal protections – a different form of intangibility than green value but critically important.

And the actors now being forced to pay higher interest rates or pay sums ranging in the millions to buy their way out of these deals include many relatively impoverished places. The inequality between rich and poor cities becomes more pronounced in the light of findings by journalists that some wealthier cities have been able to cut backroom deals with financial actors to get out of or renegotiate these arrangements; not so poorer places. These patterns suggest that the federalism of the US fiscal system, long touted for the unusual size and profitability of its subnational bond market, is equally suited for offering up predatory finance a host of vulnerable client governments, as financial centers simultaneously exploit broader national territories, look nearer to home for accumulation by dispossession opportunities, and perform self-cannibalization.

Crisis and Transformation in the US Municipal Bond Market

The subprime crisis proved a challenge in ways beyond this specific experience of damaging fiscal deals. Commentators like Peck (2012, 2013) have described how US cities felt the subprime crisis. They simultaneously lost revenue from property taxes as the real estate bubble collapse and suffered from the subsequent recession's broader collapse in spending, employment, and corresponding sales and income taxes. Meanwhile, necessary expenditures went up for aid to those unemployed by the crisis, and sometimes due to the negative financial deals discussed above; all this in a context of increasing libertarian populist to cut taxes, assault public sector unions, and otherwise impose austerity policies on US urban governments.

A critical municipal bond market implication of this increasing strain on many US cities has been increasing turmoil in the nation's bond market. Recent years have seen high-profile defaults including several California cities, Harrisburg, and not recently Detroit. In 2010, a single analyst's prediction of more widespread defaults was enough to

severely shake the market. Although a default wave of this scale had not manifested at the time of writing, that one skeptical voice in this case was enough to significantly depress the entire municipal bond market is a measure of the current insecurity in this once-safe sector. Since then, investors have watched these market developments warily, as fiscal crisis has erupted in renewed form in many places since the crisis – including major iterations in Europe. This insecurity is a stark contrast from the previous long-term stability and rock-solid nature of the market. And whole segments of the market like monoline insurance for bonds were taken out by the subprime crisis (similar to the way in which mortgage-backed securities were removed as an option from portfolios post-subprime collapse and have still not recovered).

Meanwhile, policy entrepreneurs have looked at this sector's turmoil as an opportunity and an imperative to make more fundamental changes to the US's unique subnational financing system, particularly with the decline of US local or regional capital and its replacement by an increasingly globalized capital class.

The highly successful rollout of Build America Bonds (far more successful than EECBGs) by the Obama Administration after the 2008 collapse is instructive here. These infrastructure bonds provided a higher interest rate to all urban municipal bond investors subsidized by the federal government. According to commentators the initiative was a bid to keep foreign capital in the US after the collapse of the property bubble took out many asset-backed securities – this investment in the US had become an important asset class for non-US investors. Critically, Build America Bonds opened up the US urban/subnational debt market to foreign capital at a time when foreigners' asset-backed security investment in the US housing market had collapsed, and in which considerable capital facing turbulence in other countries affected by the financial crisis (e.g., the Euro sovereign debt crisis) were still willing to invest in US cities (*particular* US cities, anyway) as a safe haven. The program claimed important successes; commentators claim that it help prevent or at least postpone even worse fiscal distress than many cities already experienced in the wake of the subprime collapse.

The US municipal finance system is technically legally vulnerable to restructuring should the political will to do so emerge (because of challenges to the way tax-exemption works as an intra-governmental subsidy). This option came up in discussions around the “fiscal cliff,” although the 2013 decision left tax-exemption in place. But we can see the emergence of new ideas in other post-2008 collapse developments in US urban financing structures, including green financing and infrastructure trust proposals. As Torrance (2008, 2009) has chronicled, funds specializing in infrastructure investment have grown; green financing proposals by World Bank (2010), Della Croce et al. (2011), Merk et al. (2012) suggest that global markets for green and climate-specific forms of debt and financial product are being positioned as a key growth area for institutional investors globally.

Interpretation: Financialization, Accumulation by Dispossession

The aforementioned dimension of inter-urban competition allows us to expand Chapter 5's discussion of the geographically uneven nature of green building in the United States to analyze the strategies of more absolutely disinvested cities. That chapter argued that

places as well as populations are being excluded from green real estate investment. We can start to see overlapping patterns emerging on the fiscal side. The increasingly uneven US geographies that neoliberalization and financialization have produced have contributed to cities' fiscal distress and strategizing, including new interest in greening as an economic strategy, and to the financialized forms that this interest is taking. The mobility of new green instruments also says much about the context and needs of the places that have taken them up, how experimental green interests may work in a time of economic struggle and austerity pressures on urban governments. It has been in desperate searches for economic recovery in which cities often undertook capital projects and took on increasingly costly debt burdens. This allows us to think about the experience of Detroit, Harrisburg, or other disinvested regions in fiscal dimensions.

The corollary of financiers' willingness to continue investing in places like high-risk cities in California has been their ability to charge high interest rates to participating cities. Of course, cities pass these rates on to their populace in critical ways, effecting indirect accumulation by dispossession in the withdrawal of services and the prioritization of certain kinds of urban functions over others. Vulnerability within even wealthy states that have not been excluded from financial markets gives us a more complex way to think about financialized accumulation. This patterning reflects the differentiated geography of the subprime crisis discussed elsewhere in this dissertation – that both absolutely disinvested places and populations and poorer populations living in capitalist centers like the Bay Area could be liable to different parts of a common process of financialized accumulation by dispossession.

In places like the Bay Area in which the extremes of wealth and poverty are geographically proximal, these green fiscal strategies – even in relatively well-off cities in the region – may be linked to accumulation by dispossession via their promotion of green gentrification (Dilworth and Stokes, 2012): just as exclusion from this investment is a concern, inclusion can have its own problems. In cities like San Francisco that have been greening hotspots, urban administrations have promoted these property booms via the kinds of programs described above. In these places, where wealth inequality can be very great at a micro-level, we can see how green strategies are being taken up in longer trends of gentrification, as well as newer moves like investor consolidation of property ownership after the subprime crisis.

Green real estate development and financial strategies are combining in complex and problematic ways in the current moment. I suggest that important parts of critical assessment of green economic development – i.e., whether it is promoting real economic development, potentially with greater redistribution, or whether it is facilitating further financial sector growth and volatility – will be fought out at this urban level, as well as the national level conflicts discussed elsewhere in the dissertation. In the broader context, these accumulations by dispossession will influence the vulnerability and resilience of many places and communities, both to further economic insecurity and to the longer-term effects of climate change and other potentially destabilizing twenty-first century transformations.

Conclusion: What Kind of Green Capitalism?

At the beginning of the twenty-first century, governments and economic institutions at the commanding heights of the global economy have sought a new reconciliation between the environment and the economy. Facing simultaneous turbulence in the world economy and in the global climatic system, they sought to turn loose capital's own logics on the environmental destabilizations that it was instrumental in creating. They moved beyond an earlier generation of thought on sustainable development to consider the radical potential of bringing greening home to world cities and industrial processes. Facing the magnitude of the changes required in the United States, either to mitigate the extent of environmental transformations or to adapt to them in the relatively near term, the only certainty seems to be that radical changes will come.

Critical research must develop a better understanding of the strategies that governments, financiers, and other powerful players are formulating around changing resource and risk geographies: to contain twenty-first century environmental transformations as threats, or to harness them for profit. At the current moment, green capitalists have constructed visions of potential transformations, and of their own role in producing these futures. In the same way, progressive and radical political movements must incorporate environmental change in the more socially just alternative visions that they construct. Critical theorists have begun to undertake this vital task, constructing scenarios of political economic organization in an environmentally transformed world: to be worked for and to be combatted. Current exercises in this vein (Davis, 2010; McMichael, 2012; Wainwright and Mann, 2013) are performing important envisioning work.

The exercises developed by Davis and others, however necessary for movement-building, by themselves shed only partial light on the specific kinds of strategic interventions achieving them may require. More grounded projection work of the kind undertaken in this study is also necessary to consider how these scenarios might be produced. This kind of analysis of actually existing practices and emergent forms in the contemporary moment is needed for characterizing capital's own responses to the problem of accumulation in a context of environmental change. The situation is now very much in flux, and is likely be shaped in path-dependent ways by the structures created now and in the near future – especially considering foreshortened timelines for taking drastic action to avert “dangerous” climate change. And this kind of strategic analysis is vital for developing the grounded political strategies needed to build alternate futures. Historical materialist methods provide an important framework. Responding to the current conjuncture, we must identify moments and arenas for political intervention by identifying accumulation strategies, animating logics, and constitutive fissures of an emerging phase of capitalist economic organization, and then projecting the development of their mounting contradictions to points of fracture and heightened transformative possibility.

As discussed in this study, progressive green economic coalitions emerging in the crisis-era United States commonly linked critiques of finance, particularly its role in blowing up the 2000s subprime housing bubble, to advocacy for rejuvenated domestic manufacturing, working class employment, and reinvestment in twentieth century

industrial cities and regions. The Apollo Alliance, Blue Green Coalition, and other organizing bodies embodied important organizing alliances between environmental groups, US organized labor, economic and racial justice organizers, Rust Belt cities, and other remnants of the Democratic Party's mid-twentieth century Keynesian base. Green collar jobs campaigns embodied these interests' attempts to regain ground lost to neoliberal policies since the 1970s and to create conditions for rejuvenated growth in manufacturing and the real economy – at their most ambitious, framing these interventions as a Green New Deal.

Left and progressive elements of green collar jobs organizing may frame their participation in this kind of collaboration as Gramscian strategy. For example, Van Jones' strategic vision circa 2009 included the following (as interviewed in Mirpuri et al., 2009):

There is a struggle going on within the upper echelons of US capital...between the military-petroleum complex that's still the dominant bloc of capital, and greener less polluting forms of capital...one holds out the prospect of eco-apocalypse, while the other holds out the prospect of some kind of eco-capitalism. From our point of view, we'd probably call it eco-apartheid, because it would be, left to its own devices, just as unjust just as exploitative as gray capitalism...do we want to weigh in on the side of either of these blocs of capital or do we want to fight them both?...We're going to pick sides....and by getting into the fight we're going to transform that fight by being more consistent advocates of the truly left out...I don't believe everything works out better when it all falls apart, and certainly not from the position of relative organizational ideological weakness that the Left is in right now" (Van Jones, cited in Mirpuri et al., 2009, pp. 405-6).

By engaging with other interests at this moment, he maintained that organizers could simultaneously achieve immediate material gains for the socially and economically marginalized, create a praxis-based framework for evaluating a green capital-led program's contradictions, and build organizational strength and hegemony for eventual program transcendence (Mirpuri et al., 2009).

Critical scholarship, like capitalism itself, has few roadmaps for envisioning techno-social changes sufficient for responding to twenty-first century environmental transformations. Climate change and other large systemic socio-environmental destabilizations confound political organizing and regulatory models based around controlling local threats to local environments: they call for new geographic imaginations and strategies. This means a deeper and higher-economic stakes arena for mitigation and adaption action than established "environmental" political action has been prepared to handle, particularly in industrial countries – social and environmental justice movements in resource-dependent economies are all too familiar with these high stakes and the bitter conflicts they can animate. We have a basically underdeveloped understanding of what it would look like or require politically for climate regulation to become sustained industrial policy – capitalist or non-capitalist, or in the broad spectrum from neoliberalism to embedded liberalism. Global environmental destabilizations also continue to challenge more established theories of transition to steady state or degrowth visions in that they present a highly abbreviated timeline for effective action and require mobilizing around shared conservation and environmental limits rather than shared surplus. Necessary energy and greenhouse gas emissions changes undermine many of the nineteenth and twentieth century productive bases of that wealth: fossil fuels, high-productivity agriculture uses of them, and so forth. Envisioning what a workable

economy based on reconstituted principles of low emissions impact and management of increased endemic risk (sometimes quite hard to predict, given the nature of climate change) is a difficult task requiring much more critical thought.

However, collective action with mainstream progressives must not be organizers' only source of ideas for these green, socially just futures. Nor must they restrict political engagement to this kind of green economic promotion, as has been made obvious by the considerable setbacks that green collar organizing faced after the 2009 push. Critical scholars and activists must continue to rigorously analyze these successes and failures of the movement, and keep working to track and critique the developing structures of green accumulation. In these visions and their developing contradictions, we must look for points of leverage for intervention, locating opportunities for more radical, transformative collective action. I have taken up this critical line on the new green accumulation and its proposed resources throughout this research, attempting to examine these programs as they have developed to see the actual economic changes and political organizing strategies that they are informing, as well as their contradictions.

Finally, throughout the analysis, I have considered different versions of a reworked green capitalism being proposed today: finance-dominated visions and more Keynesian alternatives. Both embody contradictions and points of probable breakdown. They chronically downplay difficulties arising from capitalism's growth imperative and drive to geographical creative destruction, features irreconcilable with long-term environmental stability. However, a more developmentalist state program might build different kinds of things as it unfolded. However ultimately quixotic its quest to enclose all ecosystem services and its nominal reconciliation of environmental sustainability and an ever-expanding economy, a Green New Deal-type program might produce renewable energy sources, a better-constructed and more resilient built environment, and other technologies and innovations with lasting socio-environmental use. Neoliberal environmental schemes and speculative finance have created far more troubling track records. The diagnostic task at hand, introduced in this work and continuing beyond it, is thus imperative in the development of alternative political visions.

References

- Aalbers, Manuel (2009) "Geographies of the Financial Crisis," *Area* 41.1: 34-42
- Abernathy, Frederick, Dunlop, John T., Weil, David, Apgar, William, Baker, Kermit, and Roth, Rachel (2004) *Residential Supply Chain in Transition: Summary of Findings from Survey of Dealers Harvard University: Building Products Distribution Study W04-3*, Joint Center for Housing Studies Harvard University
- Abernathy, Frederick, Baker, Kermit, Colton, Kent, and Weil, David (2012) *Bigger Isn't Necessarily Better: Lessons from The Harvard Home Builder Study*, New York: Lexington Books
- ACEEE (2011) "Fact Sheet: How Does Energy Efficiency Create Jobs?"
- (2012) 6th Annual Energy Efficiency Finance Forum, May 7-8, 2012, Omni Parker Hotel, Boston MA
- Ackermann, Marsh (2010) *Cool Comfort: America's Romance with Air-Conditioning*, Washington, DC: Smithsonian Books, Reprint edition
- Adams, Stephen B. (1997) *Mr. Kaiser goes to Washington: the rise of a government entrepreneur*, Chapel Hill, NC: The University of North Carolina Press
- Agrawal, Arun (2001) "Common Property Institutions and Sustainable Governance of Resources," *World Development* 29.10: 1649–1672
- Alcott, B. (2005) Jevons' Paradox, *Ecological Economics* 54.1: 9-21
- Ambrose, Brent W. and Peek, Joe (2008) "Credit Availability and the Structure of the Homebuilding Industry," *Real Estate Economics* 36.4: 659-692
- Anseeuw, Ward; Wily, Liz Alden; Cotula, Lorenzo and Taylor, Michael (2011) *Land Rights and the Rush for Land: Findings of the Global Commercial Pressures on Land Research Project*, International Land Coalition
- Apollo Alliance and Green for All (2008) *Green-Collar Jobs in America's Cities: Building pathways out of poverty and careers in the clean energy economy*
- Appraisal Institute (2001) *The Appraisal of Real Estate*, 12th Edition, Chicago: The Appraisal Institute
- APS Physics (2008) *Energy Future: Think Efficiency*
- Arrighi, Giovanni (2010) *The Long Twentieth Century: Money, Power and the Origins of Our Times, New and Updated Edition*, New York: Verso
- Ashton, Philip, Doussard, Marc and Webber, Rachel (2012) "The Financial Engineering of Infrastructure Privatization," *Journal of the American Planning Association*, 78.3: 300-31
- Auerswald, Philip E. and Branscomb, Lewis M. (2003) "Valleys of Death and Darwinian Seas: Financing the Invention to Innovation Transition in the United States," *Journal of Technology Transfer*, 28: 227–239
- Bakker, Karen and Bridge, Gavin (2006) "Material Worlds? Resource Geographies and the 'Matter of Nature,'" *Progress in Human Geography* 30.1: 5-27
- Bailey I. and Wilson G.A. (2009) Theorising Transitional Pathways in Response to Climate Change: Technocentrism, ecocentrism, and the carbon economy, *Environment and Planning A* 41: 2324-2341
- Banham, Reyner (1969, 1984) *The Architecture of the Well-Tempered Environment*, 2nd Revised Edition, Chicago: University Of Chicago Press

- Banton, H. Stan (2002) "The Growing Debate Over Appraisal Technology," *Mortgage Banking* October 2002
- Bardhan, Ashok and Kroll, Cynthia (2011) "Green Buildings in Green Cities: Integrating Energy Efficiency in the Real Estate Industry," Fisher Center Working Papers, Fisher Center for Real Estate and Urban Economics, UC Berkeley
- Bardhan, Ashok and Walker, Richard (2011) "California Shrugged: Fountainhead of the Great Recession," *Cambridge J Regions Econ Soc* 4.3
- Bartosiewicz, Petra and Miley, Marissa (2013) "The Too Polite Revolution: Why the Recent Campaign to Pass Comprehensive Climate Legislation in the United States Failed," January 2013, Prepared for the Symposium on The Politics of America's Fight Against Global Warming, Tsai Auditorium, Harvard University
- Bell, Daniel (1973) *The Coming of Post-Industrial Society*, New York: Basic Books
- Benton, Ted, Ed. (1995) *The Greening of Marxism*, New York: The Guilford Press
- Berger, Suzanne (2012) Panel Remarks at the "What Future for Jobs and Manufacturing" Conference, held at the Institute for Research on Labor and Employment (IRLE) at UC Berkeley, 16 November 2012
- Bernstein, Michael A. (1989) "Why the Great Depression Was Great: Toward a New Understanding of the Interwar Economic Crisis in the United States" In *The Rise and Fall of the New Deal Order 1930-1980*, Ed. Steven Fraser and Gary Gerstle, Princeton, NJ: Princeton University Press, pp. 32-54
- Berry, Linda and Schweitzer, Martin (2003) *Metaevaluation of National Weatherization Assistance Program Based on State Studies, 1993-2002*, ORNL/CON-488, Prepared by the Oak Ridge National Laboratory, Oak Ridge, Tennessee
- Berry, Linda G., Brown, Marilyn A., Kinney, and Lawrence F. (1997) *Progress Report of the National Weatherization Assistance Program*, Prepared for the Office of State and Community Programs Office of Building Technology, State and Community Programs U. S. Department of Energy; Prepared by the Oak Ridge National Laboratory, Oak Ridge, Tennessee
- Bhambhani, Dipka (2008) "State energy officials blast DOE for cutting weatherization program," *Inside Energy with Federal Lands*, 18 February 2008
- Bhatt, Sanjay (2006) "Home-building boom relies on illegal workers," *Seattle Times* 17 September 2006
- Bier, Jerilyn Klein (2010), "REITs Go Greener," *Financial Advisor (FA) Green*, April 2010 issue
- Blackmar, Elizabeth (1991) *Manhattan for Rent, 1785-1850*, Ithaca, NY: Cornell University Press
- Block, Fred (1977) *The Origins of International Economic Disorder*, Berkeley, CA: University of California Press
- (2008) "Swimming Against the Current: The Rise of a Hidden Developmental State in the United States," *Politics & Society* 36.2: 169-206
- (2011) "Crisis and renewal: the outlines of a twenty-first century new deal," *Socio-Economic Review* 9, 31-57
- (2012) Panel Remarks at the "What Future for Jobs and Manufacturing" Conference, held at the Institute for Research on Labor and Employment (IRLE) at UC Berkeley, 16 November 2012

- Block, Fred and Keller, Matthew R., Eds. (2011) *State of Innovation: The U. S. Government's Role in Technology Development*, Boulder, CO: Paradigm Publishers
- Blomley, Nicholas (2003) "Law, Property, and the Geography of Violence: The Frontier, the Survey, and the Grid," *Annals of the Association of American Geographers* 93.1: 121-141
- Bloomberg New Energy Finance (2013) <http://about.bnef.com/>
- Boardman, Brenda (2007) "Examining the carbon agenda via the 40% House scenario," Special Issue: Climate Change: National Building Stocks, *Building Research & Information* 35.4: 363-378
- Bock, Sebastian (2014), "Politicized expertise – an analysis of the political dimensions of consultants' policy recommendations to developing countries with a case study of McKinsey's advice on REDD+ policies," *Innovation: The European Journal of Social Science Research*
- BondGraham, Darwin (2012a) "Oakland's Toxic Deal with Wall Street," *East Bay Express* 15 February 2012
- (2012b) "How interest rate swap deals are causing local government agencies to pay millions of dollars to the biggest banks," *San Francisco Bay Guardian* 28 February 2012
- (2012c) "Port of Oakland Facing \$123 Million Lawsuit," *East Bay Express*, 12 September 2012
- Bourdieu, P. (1984) *Distinction*, Cambridge, MA: Harvard University Press
- Boyd, William, Prudham, Scott, and Schurman, Rachel (2001) "Industrial Dynamics and the Problem of Nature," *Society & Natural Resources: An International Journal* 14.7: 555-570
- Boykoff, M.T. and Boykoff, J.M. (2004) "Balance as bias: global warming and the US prestige press," *Global Environmental Change* 14: 125–136
- Boykoff, M.T., Bumpus, A., Liverman, D. and Randalls, S. (2009) Theorizing the carbon economy: introduction to the special issue, *Environment and Planning A* 41: 2299-2304
- Bradbury, Ray (1950) "The Veldt," *The Saturday Evening Post*, 23 September 1950
- Brand, Stewart (1995) *How Buildings Learn: What Happens After They're Built*, New York: Penguin Books
- Brenner, Robert (2006) *The Economics of Global Turbulence*, New York: Verso
- (2009) What's Good for Goldman Sachs is Good for America," Prologue, *The Economics of Global Turbulence*, Spanish Edition, pp. 34-73
- Bridge, Gavin (2009) "Material Worlds: Natural Resources, Resource Geography and the Material Economy," *Geography Compass* 3.3: 1217–1244
- (2010) Resource geographies I: Making carbon economies, old and new, *Progress in Human Geography* 35: 820-834
- Brownstein, Ronald (2009) "The California Experiment," *The Atlantic Monthly*, October 2009
- Brueggeman, William B. and Fisher, Jeffrey D. (2008) *Real Estate Finance and Investments, 13th Ed.* New York: McGraw-Hill Irwin
- Bryan, D., Martin, R., and Rafferty, M. (2009) 'Financialization: Giving labour and capital a financial makeover', *Review of Radical Political Economy*, 41.3

- Bryan, Dick and Rafferty, Michael (2007) "Financial Derivatives and the Theory of Money," *Economy and Society* 36.1: 134-158
- Building Design & Construction (2003) *White Paper on Sustainability*, November 2003
- Bulkeley, H. and Betsill, M.M. (2003) *Cities and Climate Change: Urban sustainability and global environmental governance*, New York: Routledge
- Bullock, Nicole (2011) "US Muni Bond Demand Slides Into Deep Freeze," *Financial Times*, 29 March 2011
- Bullock, Nicole and van Duyne, Aline (2011) "Hedge Funds Search for Way to Short Munis" *Financial Times*, 9 February 2011
- Bumpus, Adam and Liverman, Diana (2008) "Accumulation by Decarbonization and the Governance of Carbon Offsets," *Economic Geography* 84.2: 127-155
- Bunker, Stephen G. (1984) "Modes of Extraction, Unequal Exchange, and the Progressive Underdevelopment of an Extreme Periphery: The Brazilian Amazon, 1600-1980," *American Journal of Sociology* 89.5: 1017-1064
- (1996) "Raw material and the global economy: Oversights and distortions in industrial ecology," *Society & Natural Resources: An International Journal* 9.4: 419-429
- Buxton, A.; Campanale, M.; and Cotula, L. (2012) *Farms and Funds: Investment Funds in the Global Land Rush*, London: International Institute for Environment and Development
- California Homebuilding Foundation (2010) *The Economic Benefits of Housing in California*, Prepared by Strategic Economic Research, Sacramento CA
- Callon, Michel, Ed. (1998) *The Laws of the Markets*, Oxford: Blackwell
- Canãs, I., and Martín, S. (2004) "Recovery of Spanish vernacular construction as a model of bioclimatic architecture," *Building and Environment* 39:1477-95
- Caperton, [REDACTED] Richard W., James, Adam and Kasper, Matt (2012) "Federal Weatherization Program a Winner on All Counts," Center for American Progress, 28 September 2012, available at <http://www.americanprogress.org/issues/green/news/2012/09/28/39115/federal-weatherization-program-a-winner-on-all-counts/>
- Cardwell, Diane (2012) "Renewable Sources of Power Survive, but in a Patchwork," *The New York Times*, 10 April 2012
- Caro, Robert A. (1975) *Power Broker: Robert Moses and the Fall of New York*, New York: Vintage
- Case, Bradford; Goetzmann, William N., and Rouwenhorst, K. Geert (2000) *Global Real Estate Markets – Cycles and Fundamentals*, National Bureau of Economic Research Working Paper, Available at <http://w.nber.org/papers/w756>
- Caulfield, John (2012) "On Top, But of What?" *Builder*, 8 May 2010
- (2013) "Builders Look Forward After a Buoyant 2012," *Builder* 13 May 2013
- Chandler, Alfred Jr. (1977) *The Visible Hand: The Managerial Revolution in American Business*, Cambridge, MA: The Belnap Press of Harvard University Press
- Chapple, Karen and Hutson, Malo (2010) *Innovating the Green Economy in California Regions*, Center for Community Innovation, UC Berkeley
- Chase, John Leighton, Crawford, Margaret, and Kaliski, John (1999, 2008) *Everyday Urbanism, Expanded Edition*, New York: The Monacelli Press

- Chong, Howard (2012) "Building vintage and electricity use: Old homes use less electricity in hot weather," *European Economic Review* 56.5: 906–930
- Christophers, Brett (2010) "On Voodoo Economics: Theorising relations of property, value and contemporary capitalism," *Trans Inst Br Geogr* NS 35:94–108
- (2011) "Revisiting the Urbanization of Capital," *Annals of the Association of American Geographers* 101.6: 1347-1364
- Cidell, Julie (2009) "Building Green: The Emerging Geography of LEED-Certified Buildings and Professionals," *The Professional Geographer* 61.2: 200-215
- City of Seattle (2007) US Mayors Climate Protection Agreement, accessed 22 March 2007 from <<http://www.ci.seattle.wa.us/mayor/climate/>>
- Clark, Gordon (2000) *Pension Fund Capitalism*, New York: Oxford University Press
- Cleantech Group Inc. (2013) "Global Clean Technology Venture Investment Totals \$6.46B in 2012 Cleantech Group's Quarterly Investment Monitor Shows Venture Investment Down 33% by Investment Total; 15% by Deal Count from 2011," 3 January 2013, available at <http://www.cleantech.com/2013/01/03/global-clean-technology-venture-investment-totals-6-45b-in-2012-cleantech-groups-quarterly-investment-monitor-shows-venture-investment-down-33-by-investment-total-15-by-deal-count-from-2011/>
- Coase, R.H. (1960) "The Problem of Social Cost," *The Journal of Law and Economics* 3: 1-69
- Cochrane, Ric (2011) "Uniting Preservation with Energy Efficiency in Smaller, Older Buildings," *PreservationNation* 22 September 2011, National Trust for Historic Preservation
- Cockburn, Alexander; St. Clair, Jeffrey; Sekula, Allan (2000) *5 Days That Shook the World: Seattle and Beyond*, New York: Verso
- Cohen, Lizabeth (2004) *A Consumer's Republic: The Politics of Mass Consumption in Postwar America*, New York: Vintage Books
- Cohen, M. (2008) East Bay Green Corridor Partnership: Leveraging UCB & LBL Green Start-ups, Presentation, *Community Innovation Symposium*, College of Environmental Design, University of California, Berkeley 25 November 2008
- Cooper, Gail (1998) *Air Conditioning America: Engineers and the Controlled Environment, 1900-1960*, Baltimore, MD: Johns Hopkins University Press
- (2008) "Ch. 5, House and Home," In *A Companion To American Technology*, New York: Blackwell
- Cooper, Michael (2009) "Stimulus Funds Spent to Keep Sun Belt Cool," *The New York Times* 8 June 2009
- Costanza, Robert et al. (1997) "The Value of the World's Ecosystem Services and Natural Capital" *Nature* 387.15
- Cotula, Lorenzo (2012) "The International Political Economy of the Global Land Rush: A critical appraisal of trends, scale, geography and drivers," *The Journal of Peasant Studies* 39.3-4: 649-680
- COWS (2008) *Greener Pathways: Job and Workforce Development in the Green Economy*, Center on Wisconsin Strategy
- Cronon, William (1983) *Changes in the Land: Indians, Colonists, and the Ecology of New England*, New York: Macmillan

- Crotty, James (2012) “The great austerity war: what caused the US deficit crisis and who should pay to fix it?” *Cambridge Journal of Economics* 36: 79–104
- Crowley, John E. (1999) “The Sensibility of Comfort,” *American Historical Review* 104: 749-782
- Daniel, Shepard (2012) “Situating Private Equity Capital in the Land Grab Debate,” *The Journal of Peasant Studies* 39.3-4: 703-729
- Davidoff, Steven M. (2012) “Despite Its Problems, Dodd-Frank Is Better Than the Alternatives,” *The New York Times*, 16 October 2012
- Davis, Mike (1990) *City of Quartz: Excavating the future in Los Angeles*, New York: Vintage/Random House
- “Who will build the ark?” *New Left Review* 61:29–46
- DavisPolk (2013) “Dodd-Frank Progress Report,” Accessed 25 August 2013 at <http://www.davispolk.com/Dodd-Frank-Rulemaking-Progress-Report/>
- Dayen, David (2013) “Your New Landlord Works on Wall Street: Hedge funds are snatching up rental homes at an alarming rate,” *New Republic* 12 February 2013
- De Certeau (2011) *The Practice of Everyday Life, Reprint Edition*, Berkeley, CA: University of California Press
- DeLeon, Richard Edward (1992) *Left Coast City: Progressive Politics in San Francisco 1975-1991*, Lawrence, KS: University Press of Kansas
- Deason, Jeff and Hobbs, Andrew (2011) *Codes to Cleaner Buildings: Effectiveness of U.S. Building Energy Codes*, Climate Policy Initiative
- Defendorf, Richard (2010) “Once Again, Weatherization Cited as a Stimulus Laggard,” *GreenBuildingAdvisor.com* 24 February 2010, accessed at <http://www.greenbuildingadvisor.com/blogs/dept/green-building-news/once-again-weatherization-cited-stimulus-laggard>
- Deetz, James (1996) *In Small Things Forgotten: An Archaeology of Early American Life*, New York: Anchor
- Deininger, K.; Byerlee, D. with J. Lindsay, A. Norton, H. Selod and M. Stickler (2011) *Rising Global Interest in Farmland: Can it yield sustainable and equitable benefits?* Washington DC: World Bank
- Della Croce, R.; Kaminker, C. and Stewart, F. (2011). *The Role of Pension Funds in Financing Green Growth Initiatives*, OECD Publishing, Paris
- Deutsche Bank (DB) Climate Change Advisors (2008) *Investing in Climate Change 2009: Necessity and Opportunity in Turbulent Times*
- (2010) *Investing in Climate Change 2010: A Strategic Asset Allocation Perspective*, New York City: Deutsche Bank group
- (2011) *Investing in Climate Change 2011: The Mega-Trend Continues: Exploring Risk & Return*
- Deutsche Bank Climate Change Advisors (DBCCA) and The Rockefeller Foundation (2012) *United States Building Energy Efficiency Retrofits: Market Sizing and Financing Models*
- Dilworth, Richardson and Stokes, Robert (2012) “Green growth machines, LEED ratings and value free development: the case of the Philadelphia property tax abatement,” *Journal of Urbanism* 1-15

- DOE (2010a) *Special Report: Progress in Implementing the Department of Energy's Weatherization Assistance Program Under the American Recovery and Reinvestment Act*, Department of Energy, Washington, DC
- (2010b) *Progress in Implementing the Department of Energy's Weatherization Assistance Program Under the American Recovery and Reinvestment Act 2010*, OAS-RA-10-04 Department of Energy, Office of Inspector General, Office of Audit Services, Washington, DC
- (2010c) "Advanced Energy Efficient Building Technologies Recovery Act Selections," 17 June 2010, U.S. Department of Energy, Washington, DC, available at http://www1.eere.energy.gov/recovery/pdfs/btp_arra_selections_combined.pdf?CommunityId=6949
- Domosh, Mona (2006) *American Commodities in an Age of Empire*, New York: Routledge
- Doward, Jamie (2002) "The firm that built the house of Enron," *The Observer*, 23 March 2002
- Downs, Anthony (1985) *The Revolution in Real Estate Finance*, Brookings Institution, Washington, DC
- Duane, T.P. (2002) Regulation's rationale: learning from the California energy crisis, *Yale Journal on Regulation* 19.2: 471-540
- Earth Advantage Institute (2011) "Top Ten Green Building Trends for 2011"
- East Bay Alliance for a Sustainable Economy (EBASE) (2013) "The Campaign for Clean and Safe Ports," Accessed 20 August 2013 at <http://www.workingeastbay.org/section.php?id=45>
- Edelstein, Robert; Qian, Wenlan; and Tsang, Desmond (2011) "How Do Institutional Factors Affect International Real Estate Returns?" *The Journal of Real Estate Finance and Economics* 43.1-2: 130-151
- Eichengreen, Barry (2008) *Globalizing Capital: A History of the International Monetary System, Second Edition*, Princeton, NJ: Princeton University Press
- Einhorn, Robin L. (2001) *Property Rules: Political Economy in Chicago, 1833-1872*, Chicago: University of Chicago Press
- EERE (2008) *Energy Efficiency Trends in Residential and Commercial Buildings*, US DOE Energy Efficiency and Renewable Energy (EERE)
- (2009) *Weatherization Assistance Program - The American Recovery and Reinvestment Act of 2009*
- (2011) "DOE and The Appraisal Foundation Announce New Partnership to Focus on Energy Performance and Building Appraisals," 13 June 2011
- (2012) "EERE Celebrates Completion of 1 Million Weatherized American Homes," DOE Office of Energy Efficiency and Renewable Energy, 27 September 2012, available at <http://energy.gov/articles/eere-celebrates-completion-1-million-weatherized-american-homes>
- Ehrlich, M. and Grabelsky, J. (2005) Standing at a Crossroads: The Building Trades in the Twenty-First Century, *Labor History* 46.4: 421-445
- Eicholtz, Piet, Kok, Nils, & Quigley, John M. (2009) "Why Do Companies Rent Green? Real Property and Corporate Social Responsibility." UC Berkeley: Berkeley

- Program on Housing and Urban Policy. Retrieved from:
<http://escholarship.org/uc/item/7br1062q>
- (2010) "Doing Well by Doing Good? Green Office Buildings," *American Economic Review* 100.5: 2492-2509
- Einhorn, Robin (2001) *Property rules: political economy in Chicago, 1833-1872*. Chicago: University of Chicago Press
- Ezell, Stephen (2012) Panel Remarks at the "What Future for Jobs and Manufacturing" Conference, held at the Institute for Research on Labor and Employment (IRLE) at UC Berkeley, 16 November 2012
- Fainstein, Susan (2001) *The City Builders: Property Development in New York and London, 1980-2000, Second Edition, Revised*, Lawrence, KS: University Press of Kansas
- Fairhead, James; Leach, Melissa; and Scoones, Ian (2012) "Green Grabbing: A new appropriation of nature?" *Journal of Peasant Studies* 39:2: 237-261
- FAO (2010) *Agricultural Investment Funds for Developing Countries*, Food and Agriculture Organization of the United Nations, Rome
- Fehrenbacher, Katie (2012a), "Utilities embracing smart thermostats to help manage grids," *GigaOM*, 17 July 2012, available at <http://gigaom.com/2012/07/17/utilities-starting-to-embrace-smart-thermostats-to-help-manage-their-grids/>
- (2012b) "Opower, the big data energy player to beat," *GigaOM* 19 November 2012, available at <http://gigaom.com/2012/11/19/opower-the-big-data-energy-player-to-beat/>
- (2012c) "The 10 best and worst things to happen to cleantech in 2012," *GigaOM* 19 December 2012, available at <http://gigaom.com/2012/12/19/the-10-best-and-worst-things-to-happen-to-cleantech-in-2012/>
- (2013) "A familiar tale in cleantech: Serious Energy selling off its assets," *GigaOM* 14 August 2013
- Ferguson, Thomas (1984) "From Normalcy to New Deal: industrial structure, party competition, and American public policy in the Great Depression," *International Organization* 38: 41-94
- (1989) "Industrial Conflict and the Coming of the New Deal: The Triumph of Multinational Liberalism in America," In *The Rise and Fall of the New Deal Order 1930-1980*, Ed. Steven Fraser and Gary Gerstle, Princeton, NJ: Princeton University Press, pp. 3-31
- (1995) *Golden Rule: The Investment Theory Of Party Competition And The Logic Of Money-Driven Political Systems*, Chicago: University of Chicago Press
- The Financialist* (2013) "Deconstructing the Elusive Allure of McKinsey & Co.." 16 September 2013, Financialist Staff, *The Financialist* by Credit Suisse
- Fine, J.; Grabelsky, J.; and Narro, V. (2008) Building a Future Together: Worker centers and construction unions, *Labor Studies Journal* 33.1: 27-47
- Fisher, Bennett (2012) "How big data can tackle commercial building energy," *GigaOM* 15 February 2012, available at <http://gigaom.com/2012/02/15/how-big-data-can-tackle-commercial-energy/>
- Florida, R. (2002) *The Rise of the Creative Class: And How it's transforming work, leisure, community and everyday life*, New York: Perseus Book Group

- Fortmann, Louise (1996) "Bonanza! The unasked questions: Domestic land tenure through international lenses," *Society & Natural Resources: An International Journal* 9:5: 537-547
- Foster, John Bellamy (2000) *Marx's Ecology: Materialism and Nature*, New York: Monthly Review Press
- Fox-Gotham, Kevin (2006) "The Secondary Circuit of Capital Reconsidered: Globalization and the U.S. real estate sector," *American Journal of Sociology* 112.1: 231-275
- Frankfurt School-UNEP Centre/BNEF (2013) *Global Trends in Renewable Energy Investment 2013*, <http://www.fs-unep-centre.org> (Frankfurt am Main)
- Fraser, Steven and Gerstle, Gary, Eds. (1989) *The Rise and Fall of the New Deal Order 1930-1980*, Princeton, NJ: Princeton University Press
- Freund, David M. P. (2010) *Colored Property: State Policy and White Racial Politics in Suburban America*, Chicago: University Of Chicago Press
- Frey, Elaine F. (2003) "Building Industry Consolidation," *Housing Economics*, August 2003
- Frieden, Bernard Joel and Sagalyn, Lynne (1991) *Downtown, Inc.: How America Rebuilds Cities*, Cambridge, MA: The MIT Press
- Friedman, B., Bird, L. and Barbose, G. (2009) Considerations for Emerging Markets for Energy Savings Certificates, *NREL Analysis*, Lawrence Berkeley National Laboratory: <http://escholarship.org/uc/item/2sf4z4tb>
- Fuerst, Franz and McAllister, Patrick. 2011. "Green Noise or Green Value? Measuring the Price Effects of Environmental Certification in Commercial Buildings." *Real Estate Economics*. 39 (1): 45-69
- Fuller, Merrian, Kathy Kunkel and Daniel M. Kammen (2009) "Guide to Energy Efficiency & Renewable Energy Financing Districts For Local Governments" Renewable and Appropriate Energy Laboratory, University of California Berkeley
- Fulton, Mark (2011) "The Opportunity of Investing in Climate Change," Presentation to the International Energy Administration (IEA), Paris, France, March 15, 2011. Available at <http://www.dbcca.com/research>
- Fulton, William B. (1999) *Guide to California Planning*, Point Arena, CA: Solano Press Books
- GAO (2010) *Report to the Republican Leader: Recovery Act Project Selection and Starts Are Influenced by Certain Federal Requirements and Other Factors*, GAO-10-383 United States Government Accountability Office, Washington, DC
- Gertner, Jon (2005) "Chasing Ground," *The New York Times*, 16 October 2005
- Ghosh, Jayati (2010) "The Unnatural Coupling: Food and Global Finance," *Journal of Agrarian Change* 10.1: 72-86
- Gilmore, Ruth Wilson (2007) *Golden Gulag*, Berkeley: University of California Press
- GigaOM Pro (2009a) "In Q3, Uncle Sam Was the Green IT King Maker," Quarterly Wrap-ups, 15 October 2009, available at <http://pro.gigaom.com/2009/10/third-quarter-in-review-green-it/>
- (2009b) "Second Quarter 2009 in Review: Green IT," 20 July 2009, available at <http://pro.gigaom.com/2009/07/quarterly-wrap-up-second-quarter-2009-2/>

- Gómez-Baggethun, Erik; de Grootb, Rudolf; Lomasa, Pedro L.; and Montesa, Carlos (2010) "The History of Ecosystem Services in Economic Theory and Practice: From early notions to markets and payment schemes," *Ecological Economics* 69.6: 1209-1218
- Goetzmann, William N. and Newman, Frank (2010) "Securitization in the 1920's," NBER Working Paper No. 15650
- Goldman, Charles, Fuller, Merrian C., Stuart, Elizabeth, Peters, Jane S., McRae, Marjorie, Albers, Nathaniel, Lutzenhiser, Susan and Spahic, Mersiha (2010) *Energy Efficiency Services Sector: Workforce Size and Expectations for Growth*, Lawrence Berkeley National Laboratory
- Goldman, Michael (2005) *Imperial Nature: The World Bank And Struggles for Social Justice in the Age of Globalization*, New Haven, CT: Yale University Press
- (2011) "Speculative Urbanism and the Making of the Next World City," *International Journal of Urban and Regional Research* 35.3: 555-581
- Gómez-Baggethun, Erik; de Grootb, Rudolf; Lomasa, Pedro L.; and Montesa, Carlos (2010) "The History of Ecosystem Services in Economic Theory and Practice: From early notions to markets and payment schemes," *Ecological Economics* 69.6: 1209-1218
- Gonzalez, G.A. (2005) "Urban sprawl, global warming and the limits of ecological modernization," *Environmental Politics* 14.3: 344–362
- Gowan, Peter (1999) *The Global Gamble: Washington's Faustian Bid for World Dominance*, New York: Verso
- Graham, Stephen and Marvin, Simon (2001) *Splintering Urbanism: Networked Infrastructures, Technological Mobilities and the Urban Condition*, New York: Routledge
- Gramsci, Antonio (2000) *The Antonio Gramsci Reader: Selected Writings 1916-1935*, Ed., David Forgacs, New York: NYU Press
- Grebler, Leo (1973) "Growing Scale of Real Estate Firms and Projects" *Real Estate Economics* 1.1: 107–122
- Greening, Lorna A., Greene, David L. and Difiglio, Carmen (2000) "Energy efficiency and consumption – the rebound effect – a survey," *Energy Policy* 28.6-7: 389-401
- Grist staff (2013) "Everything you ever wanted to know about the Skocpol cap-and-trade report," *Grist*, 5 March 2013, Accessed 25 August 2013 at <http://grist.org/article/everything-you-ever-wanted-to-know-about-the-skocpol-cap-and-trade-report/>
- Groth, Paul (2004) "Workers'-Cottage and Minimal-Bungalow Districts in Oakland and Berkeley, California, 1870-1945," *Urban Morphology*
- (2007) "Bridging the Liberal Arts & Architectural Practice," From ArchCairo 2007: Linking & Bridging Academia
- Grunwald, Michael (2012a) *The New New Deal: The Hidden Story of Change in the Obama Era*, New York: Simon & Schuster
- (2012b) "Think Again: Obama's New Deal," *Foreign Policy*, Sept/Oct 2012
- Guy, S., and E. Shove (2000) *A sociology of energy, buildings and the environment: Constructing knowledge, designing practice*, New York: Routledge

- Hackworth, Jason R. (2007) *The Neoliberal City: Governance, Ideology, and Development in American Urbanism*, Ithaca, NY: Cornell University Press
- Haila, A. (1988) "Land as a financial asset: the theory of urban rent as a mirror of economic transformation," *Antipode* 20.2: 79-101
- Hanchett, Thomas W. (1996) "U.S. Tax Policy and the Shopping-Center Boom of the 1950s and 1960s," *The American Historical Review* 101.4: 1082-1110
- (2000) "Financing Suburbia: Prudential Insurance and the post-World War II transformation of the American city" *Journal of Urban History* 26: 312-328
- Hardin, Garret (1968) "The Tragedy of the Commons," *Science* 162.3859: 1243-1248
- Harris, J.; Diamond, R.; Iyer, M; Payne, C.; Blumstein, C; and Siderius, H. (2008) Towards a Sustainable Energy Balance: Progressive efficiency and the return of energy conservation, *Energy Efficiency* 1:175-188
- Harris, Richard (2009). "A New Form of Credit. The State Promotes Home Improvement, 1934-1954," *Journal of Policy History* 21.4: 392-423
- (2010) "The Talk of the Town: Kit Manufacturers Negotiate the Building Industry, 1905-1929," *Journal of Urban History* 36.6: 868-896
- Harris, Richard (2009). "A New Form of Credit. The State Promotes Home Improvement, 1934-1954," *Journal of Policy History* 21.4: 392-423
- Harris, Richard and Buzzelli, Michael (2002) *House Building in the Machine Age, 1920s-1970s: Realities and perceptions of modernisation*
- Hart, Gillian (2001) "Development critiques in the 1990s: culs de sac and promising paths," *Progress in Human Geography* 25.4: 649-658
- Hartman, Chester (2002) *City for Sale: The Transformation of San Francisco, Revised and Updated Edition*, Berkeley, CA: University of California Press
- Harvey, David (1982) *The Limits to Capital*, New York: Verso
- (1989) "From Managerialism to Entrepreneurialism: The Transformation in Urban Governance in Late Capitalism," *Geografiska Annaler. Series B, Human Geography* 71.1: 3-17
- (2003) *The New Imperialism*, New York: Oxford University Press
- (2005) *A Brief History of Neoliberalism*, New York: Oxford University Press
- Hassell, Scott, Wong, Anny, Houser, Ari, Knopman, Debra, and Bernstein, Mark (2003) *Building Better Homes: Government Strategies for Promoting Innovation in Housing*, Prepared by RAND Science and Technology Policy Institute for the U.S. Department of Housing and Urban Development (HUD) Office of Policy Development and Research and the Partnership for Advancing Technology in Housing (PATH)
- Hawkins, D. (2010) "The world agriculture industry: a study in falling supply and rising demand". 26 May, Hardman & Co, 26 May 2010
- Haya, Barbara (2010) *Carbon Offsetting: An Efficient Way to Reduce Emissions or to Avoid Reducing Emissions? An Investigation and Analysis of Offsetting Design and Practice in India and China*, PhD Dissertation, UC Berkeley
- Helleiner, Eric (1994) *States and the Reemergence of Global Finance*, Ithaca: Cornell University Press
- Henderson, George (1999) *California and the Fictions of Capital*, New York: Oxford University Press

- Henderson, Jason (2011) "Bechtel: The Global Corporation." In *Engineering Earth*, Springer Netherlands, pp. 783-801
- Henwood, Doug (1998) *Wall Street: How It Works and for Whom*, Darby, PA: Diane Publishing Company
- Hess, David J. (2012) *Good Green Jobs in a Global Economy: Making and Keeping New Industries in the United States*, Cambridge, MA: The MIT Press
- Heynen, Nik, Kaika, Maria, and Swyngedouw, Erik (2006) *In the Nature of Cities: Urban Political Ecology and the Politics of Urban Metabolism*, New York: Routledge
- Heynen, Nik, McCarthy, James, Prudham, Scott, and Robbins, Paul (2007) *Neoliberal Environments: False Promises and Unnatural Consequences*, New York: Routledge
- Higginbotham, Stacey (2012) "United States of Connectedness: What works for the Internet of things," *GigaOM* 27 August 2012, available at <http://gigaom.com/2012/08/27/united-states-of-connectedness-what-works-for-internet-of-things/>
- HighQuest Partners, United States (2010), "Private Financial Sector Investment in Farmland and Agricultural Infrastructure," *OECD Food, Agriculture and Fisheries Papers*, No. 33, OECD Publishing
- Hirsh, Richard F. (1999) *Power Loss: The Origins of Deregulation and Restructuring in the American Electric Utility System*, Cambridge, MA: The MIT Press
- Hise, Greg (1999) *Magnetic Los Angeles: Planning the Twentieth-Century Metropolis*, Baltimore, MD: Johns Hopkins University Press
- Ho, Karen (2009) *Liquidated: An Ethnography of Wall Street*, Durham, NC: Duke University Press Books
- Home Performance Resource Center (2010) "Domestic Manufacturing Shares of Common Energy Remodeling Products," February 2010, available at http://www.hprcenter.org/sites/default/files/ec_pro/hprcenter/domestic_manufacturing_shares.pdf
- Horvath, Arpad (2004) "Construction Materials and the Environment," *Annu. Rev. Environ. Resour* 29:181–204
- Houseman, Susan N.; Kurz, Christopher; Lengermann, Paul A.; Mandel, Benjamin J. (2010) "Offshoring and the State of American Manufacturing," Upjohn Institute Working Paper No. 10-166
- HSBC (2009) *A Climate for Recovery: The colour of stimulus goes green*, 25 February 2009
- Huber, Matthew T. (2009) "The Use of Gasoline: Value, Oil, and the 'American way of life,'" *Antipode* 41.3: 465–486
- Hughes, Thomas P. (1983) *Networks of Power: Electrification in Western Society, 1880-1930*, Baltimore, MD: Johns Hopkins University Press
- IMF (2012) "Chapter 3: Safe Assets: Financial System Cornerstone?" In *Global Financial Stability Report*, October 2012, International Monetary Fund, Washington, DC
- Ingham, Geoffrey (2004) *The Nature of Money*, Cambridge, UK: Polity
- Institute for Building Efficiency (2013) "Introducing Property Assessed Clean Energy Financing (PACE)," Institute for Building Efficiency, An Initiative of Johnson

- Controls, accessed 4 September 2013 at <http://www.institutebe.com/clean-energy-finance/pace-finance.aspx>
- IPCC (2000) *Special Report: Emissions Scenarios*
- (2007a) *IPCC Fourth Assessment Report: Climate Change 2007 (AR4), The AR4 Synthesis Report*
- (2007b) “Residential and Commercial Buildings,” *Working Group III: Mitigation*
- Jackson, Kenneth (1985) *Crabgrass Frontier: The Suburbanization of the United States*, New York: Oxford University Press
- Jenkins, Jeffrey (2013) “Producing environmental policy for rare earth element mining in the United States: The effect of legislation and energy markets for climate change mitigation technologies,” Presentation at Association of American Geographers 2013 Annual Meeting, Los Angeles, CA in Paper Session *Climate Policy as Industrial Policy: Emerging Geographies in the Making of the Green Economy*
- Johnson, Craig L. (1999) “Tax Increment Debt Finance: An Analysis of the Mainstreaming of a Fringe Sector,” *Public Budgeting & Finance* 19.1: 47–67
- Johnson, Leigh (2011) “Climate Change and the Risk Industry: The multiplication of fear and value” In *Global Political Ecology*, Richard Peet, Paul Robbins, and Michael Watts, Eds., New York: Routledge
- (2013) “Catastrophe Bonds and Financial Risk: Securing capital and rule through contingency,” *Geoforum* 45: 30–40
- Jones Lang LaSalle (2011) *High-Technology Industry U.S. Office Outlook*
- (2012) *Office Outlook: United States, Q2 2012*
- (2013a) *Global Sustainability Perspective*
- (2013b) *From Obsolescence to Resilience: Creating value through strategic refurbishment and asset management*
- Jones, Van (2008) *The Green Collar Economy: How One Solution Can Fix Our Two Biggest Problems*, New York: HarperCollins
- Junnila, S. and Horvath, A. (2003) “Life-cycle environmental effects of an office building,” *J. Infrastruct. Sys.* 9.4:157–66
- Junnila, S., Horvath, A., and Guggemos, A. (2004) “Life-cycle assessment of office buildings in Europe and the U.S.,” *J. Infrastruct. Syst.*
- Kaika, Maria (2005) *City of Flows: Modernity, Nature, and the City*, New York: Routledge
- Kamal, Ashok (2013) “Green Gamification: the apps, sites, and people that are going to save our planet,” *Venture Beat – Green*, 30 January 2013, available at <http://venturebeat.com/2013/01/30/green-gamification-the-apps-sites-and-people-that-are-going-to-save-our-planet/>
- Kats, Greg (2003) “The Costs and Financial Benefits of Green Buildings” *A Report to California’s Sustainable Building Task Force*
<http://www.usgbc.org/Docs/News/News477.pdf>
- Keller, Matthew R. and Block, Fred (2012) “Explaining the transformation in the US innovation system: the impact of a small government program,” *Socio-Economic Review*: 1–28
- Kenney, Martin Ed. (2000) *Understanding Silicon Valley: The Anatomy of an Entrepreneurial Region*, Palo Alto, CA: Stanford Business Books

- Kenney, Martin and Florida, Richard (2000) "Venture Capital in Silicon Valley: Fueling New Firm Formation," In *Understanding Silicon Valley: The Anatomy of an Entrepreneurial Region*, Martin Kenney Ed., Palo Alto, CA: Stanford Business Books
- Kindleberger, Charles P. (1984) *A Financial History of Western Europe*, New York: Routledge
- Kok, Nils, McGraw, Marquise and Quigley, John M. (2011) "Energy Conservation and Electricity Demand: The Diffusion of Energy Efficiency in Building," *American Economic Review: Papers & Proceedings 2011* 101.3: 77–82
- Knuth, Sarah (2010) "Addressing place in climate change mitigation: Reducing emissions in a suburban landscape," *Applied Geography* 30.4: 518–531
- Kratke, Stefan (2011) *The Creative Capital of Cities: Interactive Knowledge Creation and the Urbanization Economies of Innovation*, Malden, MA: Wiley-Blackwell
- Krippner, Greta (2005) "The Financialization of the American Economy," *Socio-Economic Review* 3: 173–208
- Krugman, Paul (2012) "The Austerity Debacle," *The New York Times* 29 January 2012
- Lansing, David M. (2012) "Performing carbon's materiality: the production of carbon offsets and the framing of exchange," *Environment and Planning A* 44: 204–220
- Larner, Wendy and Laurie, Nina (2010) "Travelling technocrats, embodied knowledges: Globalising privatisation in telecoms and water," *Geoforum* 41.2: 218–226
- Laulajainen, Risto (2003) *Financial Geography: A Banker's View*, New York: Routledge
- Lee, Roger; Clark, Gordon L; Pollard, Jane; and Leyshon, Andrew (2009) "The remit of financial geography—before and after the crisis," *Journal of Economic Geography* 9: 723–747
- Lefebvre, Henri (2008) *Critique of Everyday Life, Vol. I: Introduction, Special Edition*, New York: Verso
- Leitner, Helga (1990) "Cities in Pursuit of Economic Growth: The Local State as Entrepreneur," *Political Geography Quarterly* 9.2: 146–170
- Lemer, A.C. (1996) "Infrastructure obsolescence and design service life," *J. Infrastruct. Syst.* 2.4: 153–61
- Leon, Kenneth (2011) "Sustainability taking roots in the housing market," *HousingViews* 23 June 2011, available at <http://www.housingviews.com/2011/06/23/sustainability-taking-roots-in-the-housing-market/>
- Leonhardt, David (2011) "Consultant Nation," *The New York Times*, 11 December 2011
- Lesser, Adam (2013) "What the internet of things means for cleantech," *GigaOM Pro* 26 August 2013, available at <http://pro.gigaom.com/report/what-the-internet-of-things-means-for-cleantech/>
- Levy, David L. and Egan, Daniel (2003) "A Neo-Gramscian Approach to Corporate Political Strategy: Conflict and Accommodation in the Climate Change Negotiations," *Journal of Management Studies* 40.4: 803–829
- Lewis, Peirce (1979) "Axioms for Reading the Landscape," In *Interpretation of Ordinary Landscapes*, Donald W. Meinig, Ed. New York: Oxford University Press
- Leyshon, Andrew and Thrift, Nigel (1997) *Money/Space: Geographies of Monetary Transformation*, New York: Routledge

- Linklater, Andro (2003) *Measuring America: How the United States Was Shaped By the Greatest Land Sale in History*, New York: Plume
- LiPuma, Edward and Lee, Benjamin (2005): Financial derivatives and the rise of circulation, *Economy and Society*, 34:3: 404-427
- Liverman, Diana (2004) "Who Governs, at What Scale and at What Price? Geography, environmental governance, and the commodification of nature," *Annals of the Association of American Geographers* 94.4: 734-738
- Loeb, Carolyn S. (2001) *Entrepreneurial Vernacular: Developers' Subdivisions in the 1920s*, Baltimore, MD: Johns Hopkins University Press
- Loewenthal, Nathaniel (2013) "Of Stasis and Movements: Climate Legislation in the 111th Congress," ISPS Working Paper Series
- Logan, John (1993) "Cycles and Trends in the Globalization of Real Estate," In, *The Restless Urban Landscape*, Paul Knox, Ed, pp. 35-54
- Logan, John R. and Molotch, Harvey L. (2007 [1987]) *Urban Fortunes: The Political Economy of Place, twentieth Anniversary Edition*, Berkeley, CA: University of California Press
- Lohmann, L. (2005) "Marketing and making carbon dumps: Commodification, calculation and counterfactuals in climate change mitigation," *Science as Culture* 14: 203-235
- (2009) "Toward a different debate in environmental accounting: The cases of carbon and cost-benefit," *Accounting, Organizations and Society* 34.3-4: 499-534
- Lovell, Heather and Liverman, Diana (2010) "Understanding Carbon Offset Technologies," *New Political Economy* 12.2: 255-273
- Lovins, Amory (1976) "Energy Strategy: The Road Not Taken," *Foreign Affairs* 55.1: 65-96
- Lutzenhiser, L. (1993) Social and Behavioral Aspects of Energy use, *Annual Reviews in Energy and the Environment* 18: 247-289
- Mackenzie, Donald (2006) *An Engine, Not a Camera: How Financial Models Shape Markets*, Cambridge, MA: The MIT Press
- (2009) "Making Things the Same: Gases, emissions rights and the politics of carbon markets. Accounting," *Organization and Society* 34.3-4: 440-455
- MacPherson, C.B. (1999) *Property: Mainstream and Critical Positions, 2nd Revised edition*, Toronto: University of Toronto Press
- Mallach, Alan (2012) *Laying the Groundwork for Change: Demolition, urban strategy, and policy reform*, Brookings Metropolitan Policy Program September 2012
- Mansfield, Becky (2004) "Rules of Privatization: Contradictions in Neoliberal Regulation of North Pacific Fisheries," *Annals of the Association of American Geographers* 94.3: 565-584
- McMichael, Philip (2012) "The Land Grab and Corporate Food Regime Restructuring" *The Journal of Peasant Studies* 39.3-4
- Makowsky, Michael D. and Wagner, Richard E. (2009) "From scholarly idea to budgetary institution: the emergence of cost-benefit analysis," *Const Political Economy*: 20:57-70

- Markusen, Ann; Hall, Peter; Campbell, Scott; and Deitrick, Sabina (1991) *The Rise of the Gunbelt: The Military Remapping of Industrial America*, New York: Oxford University Press
- Marx, Karl (1867, 1990) *Capital, Volume I*
- McAfee, Kathleen (1999) "Selling nature to save it? Biodiversity and green developmentalism," *Environment and Planning D: Society and Space* 17.2: 133–54
- McAllister, Patrick M. and Fuerst, Franz (2009) "New Evidence on the Green Building Rent and Price Premium," <http://ssrn.com/abstract=1372440>
- McAllister, Pat. (2009) "Assessing the valuation implications of the eco-labeling of commercial property assets," *Journal of Retail and Leisure Property*. 8.4: 311-322
- McCann, James D. and Gross, Philip S. (2012) "Potential Tax Benefits of Private REITs for Hedge Funds and Private Equity Funds," *Private Investment Forum*, Spring 2012
- McCann, Eugene and Ward, Kevin (2011) *Mobile Urbanism: Cities and policymaking in the global age*, Minneapolis, MN: University of Minnesota Press
- (2012) "Assembling urbanism: following policies and 'studying through' the sites and situations of policy making," *Environment and Planning A* 44: 42-51
- McCarthy, James (2002) "First World political ecology: lessons from the Wise Use movement," *Environment and Planning A* 34: 1281-1302
- (2005) "Devolution in the woods: community forestry as hybrid neoliberalism," *Environment and Planning A* 37.6: 995-1014
- (2012) "Political Ecology/Economy," Chapter 39, *The Wiley-Blackwell Companion to Economic Geography*, Trevor J. Barnes, Jamie Peck, and Eric Sheppard, Eds., Hoboken, NJ: Wiley-Blackwell, 612-625
- McDonald, Terrence J. (1986) *The Parameters of Urban Fiscal Policy: Socioeconomic Change and Political Culture in San Francisco 1860-1906*, Berkeley, CA: University of California Press
- McGraw-Hill Construction (2010) *Green Outlook 2011: Green Trends Driving Growth*
- (2012a) *2013 Dodge Construction Green Outlook*
- (2012b) "Press Release: Green Building Outlook Strong for Both Non-Residential & Residential Sectors Despite Soft Economy, Says New Report from Dodge," McGraw-Hill Construction, 15 November 2012
- (2013) *World Green Building Trends SmartMarket Report*
- McKinsey & Co. (2009) *Unlocking Energy Efficiency in the US Economy*, McKinsey Global Energy and Materials
- McMichael, Philip (2009) "The Agrofuels Project at Large," *Critical Sociology* 35: 825-839
- (2012) "The Land Grab and Corporate Food Regime Restructuring" *The Journal of Peasant Studies* 39.3-4 : 681-701
- Merk, O., Saussier, S., Staropoli, C., Slack, E., Kim, J-H (2012), *Financing Green Urban Infrastructure*, OECD Regional Development Working Papers 2012/10, OECD Publishing; <http://dc.doi.org/10.1787/5k92p0c6j6r0-en>
- Millennium Ecosystem Assessment (2005) *Ecosystems and Human Well-being: Biodiversity Synthesis*, World Resources Institute, Washington, DC.

- Mirpuri, A.; Feldman, K.P., and Roberts, G.M. (2009) "Antiracism and Environmental Justice in an Age of Neoliberalism: An interview with Van Jones," *Antipode* 41.3: 401-415
- Moe, Richard (2009) "Op-Ed: This Old Wasteful House," *The New York Times* 6 April 2009
- Mokyr, Joel (1990) *The Lever of Riches: Technological Creativity and Economic Progress*, New York: Oxford University Press
- Mol, Arthur P.J. and Spaargaren, Gert (2000) "Ecological modernisation theory in debate: A review," *Environmental Politics* 9.1: 17-49
- Mollenkopf, John H. (1983) *The Contested City*, Princeton, NJ: Princeton University Press
- Moore, Heidi (2013) "Obama to meet with regulators over stalled Dodd-Frank reform act," *The Guardian*, 19 August 2013
- Moore, Jason W. (2000) "Sugar and the Expansion of the Early Modern World-Economy: Commodity Frontiers, Ecological Transformation, and Industrialization." *Review: Fernand Braudel Center* 23.3: 409-433
- (2010) "The End of the Road? Agricultural Revolutions in the Capitalist World-Ecology, 1450–2010," *Journal of Agrarian Change* 10.3: 389-413
- Mooya, Manya (2011) "Of Mice and Men : Automated Valuation Models and the Valuation Profession," *Urban Studies* 48.11: 2265–2281
- Morgenstern, Gretchen (2012) "How Banks Could Return the Favor," *New York Times* 9 June 2012
- Morrissey, Janet (2012) "Big Money Bets on a Housing Rebound," *New York Times*, 8 December 2012
- Muldavin, Scott R. (2010) *Value Beyond Cost Saving: How to Underwrite Sustainable Properties*, San Rafael: Green Building Finance Consortium
- Mulvaney, Dustin (2013a) "Innovation mythologies in the Green New Deal: Solyndra, shadow banks, and solar bubbles," Presentation at Association of American Geographers 2013 Annual Meeting, Los Angeles, CA in Paper Session *Climate Policy as Industrial Policy: Emerging Geographies in the Making of the Green Economy*
- (2013b) "Opening the Black Box of Solar Energy Technologies: Exploring Tensions Between Innovation and Environmental Justice," *Science as Culture* 22.2 230-237
- NAHB (2009) Letter to Nancy Sutley; Chair, White House Council on Environmental Quality, regarding the Recovery Through Retrofit Report, November 19, 2009, From Susan Asmus, Senior Vice President for Environmental and Regulatory Affairs, National Association of Home Builders.
- Newell, P. and Paterson, M. (1998) "A climate for business: global warming, the state and capital," *Review of International Political Economy* 5: 679-703
- Newman, Kathe (2009) "Post-Industrial Widgets: Capital Flows and the Production of the Urban," *International Journal of Urban and Regional Research* 33.2: 314-331
- Newton, Adrian C. (2011) "The green economy and the knowledge economy: exploring the interface," *Int. J. Green Economics* 5.3: 231-247
- Next10 (2009) *Many Shades of Green: Diversity and Distribution of California's Green Jobs*

- (2010) *Untapped Potential of Commercial Buildings: Energy Use and Emissions*
- Novet, Jordan (2013) “Big data can improve websites, cut energy bills, save lives,” *GigaOm*, 28 February 2013, available at <http://gigaom.com/2013/02/28/big-data-use-cases-abound-at-strata-conference/>
- NREL (2010) “Funding Sources for Property Assessed Clean Energy (PACE) Programs,” Renewable Energy Project Finance, National Renewable Energy Laboratory, accessed 4 September 2013 at <https://financere.nrel.gov/finance/content/funding-sources-property-assessed-clean-energy-pace-programs>
- Nye, David E. (1992) *Electrifying America: Social Meanings of a New Technology*, Cambridge, MA: The MIT Press
- Oikonomou, V. and Mundaca, L. (2008) Tradable white certificate schemes: what can we learn from tradable green certificate schemes? *Energy Efficiency* 1:211–232
- Olgyay, Victor (1963) *Design With Climate: Bioclimatic Approach to Architectural Regionalism*, Princeton, NJ: Princeton University Press
- Olgyay, Victor and Seruto, Cherlyn (2010) “Whole-building retrofits: A gateway to climate stabilization,” *ASHRAE Transactions* 116.2
- Ostrom, Elinor (2000) “Collective Action and the Evolution of Social Norms,” *The Journal of Economic Perspectives* 14.3: 137-158
- Ozay, N. (2005) “A comparative study of climatically responsive house design at various periods of northern Cyprus architecture,” *Building and Environment* 40:841–52
- Pacala, S., and Socolow, R. (2004) Stabilization wedges: solving the climate problem for the next 50 years with current technologies, *Science* 305: 968-972
- Pacewicz, Josh (2012) “Tax increment financing, economic development professionals and the financialization of urban politics,” *Socio-Economic Review* 1–28
- Pacific Carbon Exchange (2010) *Creating a California Energy Efficiency Market: An Energy Efficiency Credits (EEC) Protocol in California*: <http://www.pcarbx.com/PressDownloads/PcarbXEECMktPlanPrecis.pdf>
- Palmer, Anna (2013) “Big Builders Erect New Trade Association,” *Roll Call*, 8 September 2013
- Park, Kevin (2009) *Green Shoots in the Remodeling Industry: Contractor Characteristics That Affect Green Product Use*, W09-1, Joint Center for Housing Studies of Harvard University, available at <http://www.jchs.harvard.edu/research/publications/green-shoots-remodeling-industry-contractor-characteristics-affect-green>
- Passel, Jeffrey S. (2006) “The Size and Characteristics of the Unauthorized Migrant Population in the U.S.: Estimates Based on the March 2005 Current Population Survey,” *Pew Hispanic*, Center 7 March 2006
- Peck, Jamie (2005) “Struggling With the Creative Class,” *International Journal of Urban and Regional Research* 29.4: 740–770
- (2012) “Austerity urbanism: American cities under extreme economy,” *City* 16.6
- (2013) “Pushing austerity: state failure, municipal bankruptcy and the crises of fiscal federalism in the USA,” *Cambridge Journal of Regions, Economy and Society*
- Peck, Jamie and Theodore, Nick (2010) “Mobilizing Policy: Models, methods, and mutations,” *Geoforum* 41.2: 169–174
- Peck, Jamie and Tickell, Adam (2002) “Neoliberalizing Space,” *Antipode* 34.3: 380-404

- Peet, Richard and Watts, Michael, Eds. (2002) *Liberation Ecologies*, 2nd Edition, New York: Routledge
- Peluso, Nancy Lee, Humphrey, Craig R., and Fortmann, Louise P. (1994) "The rock, the beach, and the tidal pool: People and poverty in natural resource-dependent areas," *Society & Natural Resources: An International Journal* 7.1: 23-38
- Peluso, Nancy Lee (1992) *Rich Forests, Poor People: Resource Control and Resistance in Java*, Berkeley, CA: University of California Press
- The Pennsylvania Budget and Policy Center (2012) *Too Big To Trust? Banks, Schools, and the Ongoing Problem of Interest Rate Swaps*
- Pernick, Ron; Wilder, Clint; Winnie, Trevor (2013) *Clean Energy Trends 2013*, CleanEdge, March 2013
- Peters, Thomas J. and Waterman, Robert H. (1982) *In Search of Excellence: Lessons from America's best-run companies*, New York: Harper and Row
- Pew Charitable Trusts (Pew) (2010) *Who's Winning the Clean Energy Race? Growth, Competition and opportunity in the World's largest economies*
 ----- (2012) *Who's Winning the Clean Energy Race? 2012 Edition*
- Pike Research (2010) *Green Building Certification Programs*
 ----- (2011) *Energy Efficient Buildings: Global Outlook*
 ----- (2012a) *Energy Efficient Homes*
 ----- (2012b) *Energy Efficiency Retrofits for Commercial and Public Buildings*
 ----- (2012c) *Smart Buildings: Ten Trends to Watch in 2012 and Beyond*
 ----- (2013) *Materials in Green Buildings*
- Pinderhughes, R. (2007) *Green Collar Jobs: A case study of Berkeley, CA*
- Polanyi, Karl (2001) [1944] *The Great Transformation* Boston, MA: Beacon Press (2nd Ed.)
- Pollin, Robert (2013) "Austerity Economics and the Struggle for the Soul of US Capitalism," *PERI Working Paper series*, April 2013, Number 321
- Pooley, Eric (2013) "Why the climate bill failed: It's not that simple," *Grist*, 18 January 2013, Accessed 25 August 2013 at <http://grist.org/climate-energy/why-the-climate-bill-failed-its-not-that-simple/>
- Preservation Green Lab (2012) *The Greenest Building: Quantifying the Environmental Value of Building Reuse*, The National Trust for Historic Preservation
- PriceWaterhouseCoopers LLC and Urban Land Institute (2013) *Emerging Trends in Real Estate® 2013*
- Prudham, Scott (2009) "Pimping climate change: Richard Branson, global warming, and the performance of green capitalism," *Environment and Planning A* 41:1594-1613
- Rampton, Roberta (2012) "Tweaking US Tax Code Could Spur Green Energy-Senator," *Reuters* 06 June 2012
- Ramsey, Ranney (2004) "The Urban Land Economics Tradition: How Heterodox Economic Theory Survives in the Real Estate Appraisal Profession," In W.J. Samuels, Ed. *Wisconsin "Government and Business" and the History of Heterodox Economic Thought (Research in the History of Economic Thought and Methodology, Volume 22)*, Emerald Group Publishing Limited, pp.347-378
- Recovery.gov (2013) "Track the Money," Accessed 25 August 2103 at <http://www.recovery.gov/Pages/default.aspx>

- Redclift, Michael R. (2006) *Frontiers: Histories of Civil Society and Nature*, Cambridge, MA: The MIT Press
- Redman, E. (2009) *Building the East Bay Green Economy*
- Refund Transit Coalition (2012) *Riding the Gravy Train: How Wall Street Is Bankrupting Our Public Transit Agencies by Profiteering off of Toxic Swap Deals*, June 2012
- Renping, W., and Zhenyu, C. (2006) "An ecological assessment of the vernacular architecture and of its embodied energy in Yunnan, China," *Building and Environment* 41:687–97
- Rice, Jennifer L. (2010) "Climate, Carbon, and Territory: Greenhouse Gas Mitigation in Seattle, Washington," *Annals of the Association of American Geographers*, 100:4, 929-937
- Roberts, David (2013) "The Road Forward From Cap-And-Trade," *Grist*, 16 January 2013, accessed 25 August 2013 at <http://grist.org/politics/the-road-forward-from-cap-and-trade/>
- Robertson, Morgan M. (2006) "The Nature That Capital Can See: Science, state, and market in the commodification of ecosystem services," *Environment and Planning D* 24: 367-387
- Robbins, Paul (2011) *Political Ecology: A Critical Introduction*, 2nd Ed. Hoboken, NJ Wiley-Blackwell
- Roland-Holst, David (2008) "Energy Efficiency, Innovation, and Job Creation in California," CERES
- Rosenthal, Elisabeth and Lehren, Andrew W. (2012) "Profits on Carbon Credits Drive Output of a Harmful Gas," *New York Times* 8 August 2012
- Roy, Ananya (2009) "The 21st-Century Metropolis: New Geographies of Theory," *Regional Studies* 43:6, 819-830
- (2010) *Poverty Capital: Microfinance and the Making of Development*, New York: Routledge
- RREEF (2007) "The Greening of U.S. Investment Real Estate – Market Fundamentals, Prospects and Opportunities," *RREEF Research* 57
- (2008) "Globalization and Global Trends in Green Real Estate Investment," *RREEF Research* 64
- (2010) "Green Buildings - A Niche Becomes Mainstream," *RREEF Research*
- Sakolski, A.M. (1932) *The Great American Land Bubble*, New York: Harper & Brothers Publishers
- Sanne, C. (2002) Willing consumers—or locked-in? Policies for a sustainable consumption, *Ecological Economics* 42.1-2: 273-287
- Sassen, Saskia (2001) *The global city: New York, London, Tokyo*. Updated ed. Princeton, NJ: Princeton University Press. (1st ed. 1991)
- (2009a) "Cities Today: A New Frontier for Major Developments" *The Annals of the American Academy of Political and Social Science* 626: 53-71
- (2009b) "When Local Housing Becomes an Electronic Instrument: The global circulation of mortgages — a research note," *International Journal of Urban and Regional* 33.2: 411-26
- Saxenian, A.L. (1996) *Regional advantage: culture and competition in Silicon Valley and Route 128*

- Sayre, Nathan F. (2010) "Climate Change, Scale, and Devaluation: The Challenge of Our Built Environment," *Wash. & Lee J. Energy, Climate & Env't.* 1.1: 93-105
- Sbragia, Alberta M., Ed. (1983) *The Municipal Money Chase: the Politics of Local Government Finance*, Boulder, CO: Westview Press
- (1996) *Debt wish: Entrepreneurial Cities, US Federalism, and Economic Development*, Pittsburgh, PA: University of Pittsburgh Press
- Schachter, Robert (2012) "Rebounding of the Real Estate Investment Trust (REIT) – Tax Considerations and Potential Legislation," *Private Investment Forum*, Spring 2012
- Schneider, Steven R. (2011) "Timber Forest Carbon Emission Units are Good REIT Assets," *Commercial Real Estate Week in Review*, 13 June 2011
- Schrag, Peter (1998, 2004) *Paradise Lost: California's Experience, America's Future*, Berkeley, CA: University of California Press
- Schweitzer, Martin and Tonn, Bruce (2003) "Non-energy benefits of the US Weatherization Assistance Program: a summary of their scope and magnitude," *Applied Energy* 76: 321–335
- Scobey, David (2003) *Empire City: The Making and Meaning of the New York City Landscape*, Philadelphia: Temple University Press
- Scott, James (1998) *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*. New Haven, CT: Yale University Press
- Self, Robert O. (2003) *American Babylon: Race and the Struggle for Postwar Oakland*, Princeton, NJ: Princeton University Press
- Shapiro, Mark (2010) "Conning the Climate: Inside the Carbon-Trading Shell Game" *Harper's Magazine*, February 2010
- Shi, David E. (2001) *The Simple Life: Plain Living and High Thinking in American Culture*, Athens, GA: University of Georgia Press
- Shiller, Robert (2003) *The New Financial Order: Risk in the 21st Century*, Princeton, NJ: Princeton University Press
- Shove, E. (2003) *Comfort, Cleanliness and Convenience: The Social Organization of Normality*, New York: Bloomsbury Academic Publishing
- Silicon Valley Toxics Coalition (2009) *Toward a Just and Sustainable Solar Energy Industry*, A Silicon Valley Toxics Coalition White Paper, January 14, 2009
- (2013) "Our Work," Accessed 20 August 2013 at <http://svtc.org/our-work/>
- Silver, Beverly and Arrighi, Giovanni (2003) "Polanyi's 'Double Movement': The Belle Époques of British and U.S. Hegemony Compared," *Politics and Society* 31.2
- Sissine, Fred (2012) *DOE Weatherization Program: A Review of Funding, Performance, and Cost-Effectiveness Studies*, Congressional Research Service 7-5700
- Smil, Vaclav (2000) "Energy in the Twentieth Century: Resources, Conversions, Costs, Uses, and Consequences," *Annual Review of Energy and the Environment* 25: 21-51
- Smith, Mary F. and Richardson, Joe (1989) *Comparison of the Departments of Energy and Health and Human Services Weatherization Assistance Programs*
- Smith, Neil (2003 [1984]) *Uneven Development: Nature, Capital, and the Production of Space*, Athens, GA: The University of Georgia Press
- (1996) *The New Urban Frontier: Gentrification and the Revanchist City*, New York: Routledge

- SPUR (2008) Growing Green: How San Francisco can become a leader in the cleantech boom, *The Urbanist*, September 2008
- State Budget Crisis Task Force (2012) *Report of the State Budget Crisis Task Force*, July 2012
- Stevens, G. (2002) *The Favored Circle: The Social Foundations of Architectural Distinction*, Cambridge, MA: The MIT Press
- Storper, Michael and Walker, Richard (1989) *The Capitalist Imperative: Territory, Technology, and Industrial Growth*, New York: Basil Blackwell
- Strange, Susan (1998) *Mad Money: When Markets Outgrow Governments* Manchester: Manchester University Press
- Sugrue, Thomas (2005 [1996]) *The Origins of the Urban Crisis: Race and Inequality in Postwar Detroit, Revised edition*, Princeton, NJ: Princeton University Press
- Suskind, Ron (2011) *Confidence Men: Wall Street, Washington, and the Education of a President*, New York: Harper
- Swyngedouw, Erik (2009) "Climate Change as Post-Political and Post-Democratic Populism," Paper presented at DVPW conference, Kiel, Germany, 22–25 September
- Strickland, Tom (2013) "The financialisation of urban development: Tax Increment Financing in Newcastle upon Tyne," *Local Economy* 28.4: 384–398
- Tassava, Christopher James (2003) "Multiples of Six: The Six Companies and West Coast Industrialization, 1930–1945," *Enterprise and Society* 4: 1-27
- Teaford, Jon (1984) *The Unheralded Triumph: City Government in America 1870-1900*, Baltimore, MD: Johns Hopkins University Press
- Tobey, Ronald C. (1997) *Technology as Freedom: The New Deal and the Electrical Modernization of the American Home*, Berkeley, CA: California University Press
- Tonn, Bruce, Rose, Erin, Schmoyer, Richard, Eisenberg, Joel, Ternes, Mark, Schweitzer Martin, and Hendrick, Timothy (2011) *Evaluation of the National Weatherization Assistance Program during Program Years 2009-2011 (American Reinvestment and Recovery Act Period)*, ORNL/TM-2011/87, Prepared by Oak Ridge National Laboratory, Oak Ridge, Tennessee
- Torrance, Morag (2008) "Forging Glocal Governance? Urban Infrastructures as networked financial products" *International Journal of Urban and Regional Research* 32.1: 1-21
- (2009) "Reconceptualizing urban governance through a new paradigm for urban infrastructure networks," *Journal of Economic Geography* 9: 805–822
- Treuhart, Sarah; Rose, Kalima; Black, Karen (2010) When Investors Buy up the Neighborhood: Preventing Investor Ownership from Causing Neighborhood Decline, Available at <http://www.nwaf.org/FileCabinet/DocumentCatalogFiles/Other/PolicyLink%20When%20Investors.pdf>
- Tsing, Anna Lowenhaupt (2005) *Friction: An Ethnography of Global Connection*, Princeton, NJ: Princeton University Press
- Turner, B.L. II; Kasperson, Roger E.; Meyer, William B.; Dow, Kirstin M.; Golding, Dominic; Kasperson, Jeanne X; Mitchell, Robert C.; and Ratick, Samuel J. (1990) "Two types of global environmental change: Definitional and spatial-scale issues in their human dimensions," *Global Environmental Change* 1.1: 14–22

- Turner, Fred (2006) *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism*, Chicago: University of Chicago Press
- UNCTAD (2009) *World Investment Report 2009: Transnational Corporations, Agricultural Production and Development*, United Nations Conference on Trade and Development, Geneva
- UN-Habitat (2011) "What Does the Green Economy Mean for Sustainable Urban Development?" Expert Group Meeting, 17-18 February 2011, Nairobi
- UN-REDD (2013) <http://www.un-redd.org/>
- UNEP (2008) *Green Jobs: Towards decent work in a sustainable, low-carbon world*
 ----- (2009) *Rethinking the Economic Recovery: A Global Green New Deal*
 ----- (2011) *Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication*, www.unep.org/greeneconomy
- UNEP SBCI (2009) *Buildings and Climate Change*, UNEP Sustainable Buildings & Climate Initiative
- Upton, Dell (2000) "Inventing the Metropolis: Civilization and Urbanity in Antebellum New York," In *Art and the Empire City: New York, 1825-1861*, Catherine Hoover Voorsanger and John K. Howat, Eds.
- Urban Land Institute (2010a) *New Tools. New Rules.: Climate Change, Land Use, and Energy 2010*, Washington, D.C.: Urban Land Institute
 ----- (2010b) "Green Buildings - A Niche Becomes Mainstream," *RREEF Research*
- US Energy Information Administration (EIA) (2009) *2009 Residential Energy Consumption Survey (RECS)*
 -----(2005) *2005 Residential Energy Consumption Survey (RECS)*
- US Treasury Department (2013) "Troubled Asset Relief Program (TARP) Monthly Report to Congress, December 2012"
- Van der Ploeg, Jan Douwe (2010), "The Food Crisis, Industrialized Farming and the Imperial Regime," *Journal of Agrarian Change* 10: 98-106
- Van Grove, Jennifer (2012) "Opower embraces big data to lower your utility bill," *Venture Beat – Big Data*, 19 November 2012, available at <http://venturebeat.com/2012/11/19/opower-4/>
- Vine, E. and Hamrin, J. (2008) Energy savings certificates: A market-based tool for reducing greenhouse gas emissions, *Energy Policy* 36: 467–476
- Wade, Robert (1997) *Greening the bank: the struggle over the environment, 1979–1995*. In Kapur, D., editor, *The World Bank: its first half century* Washington, DC: Brookings Institution Press, 611–734
- Wainwright, Joel and Mann, Geoff (2013) "Climate Leviathan," *Antipode* 45.1: 1-22
- Walker, Richard (1974) "Urban ground rent: building a new conceptual framework," *Antipode* 6.1: 51-58
 ----- (1977) *The Suburban Solution: Urban Geography and Urban Reform in the Capitalist Development of the United States*, PhD Dissertation, Johns Hopkins University
 ----- (1979) "Editor's introduction, Special Issue on Natural Resources and Environment," *Antipode*, 11:2: 1-16

- (1981) "A Theory of Suburbanization: Capitalism and the Construction of Urban Space in the United States," In *Urbanization and Urban Planning in Capitalist Society*, Michael Dear and Allen Scott Eds.
- (2001) "California's Golden Road to Riches: Natural Resources and Regional Capitalism 1848-1940," *Annals of the Association of American Geographers* 91.1: 167-199
- (2006) "The Boom and the Bombshell: The New Economy Bubble and the San Francisco Bay Area," In *The Changing Economic Geography of Globalization*, Giovanna Vertova Ed.
- (2008a) *The Country in the City: The greening of the San Francisco Bay Area*, Seattle: University of Washington Press
- (2008b) "At The Crossroads: Defining California Through the Global Economy," Ch. 4, In *A Companion to California History*, William Deverell and David Iglar, Eds. New York: Wiley-Blackwell
- Walker, Richard and Heiman, Michael K. (1981) "Quiet Revolution for Whom?" *Annals of the Association of American Geographers* 71.1: 67-83
- Walker, Richard and Large, David B. (1974) "The Economics of Energy Extravagances," *Ecological Law Quarterly* 963-986
- Watts, Michael (2004) "Resource curse? governmentality, oil and power in the Niger Delta, Nigeria," *Geopolitics* 9.1: 50-80
- Weber, Rachel (2002) "Extracting Value from the City: Neoliberalism and urban redevelopment," *Antipode* 34.3: 519-540
- (2010) "Selling City Futures: The Financialization of Urban Redevelopment Policy," *Economic Geography* 86.3: 251-274
- Wei, Max, Patadia, Shana, and Kammen, Daniel (2010) "Putting renewables and energy efficiency to work: How many jobs can the clean energy industry generate in the US?" *Energy Policy* 38: 919-931
- Weiss, Mark A. (2002 [1987]) *The Rise of the Community Builders: The American Real Estate Industry and Urban Land Planning*, Washington, DC: Beard Books
- (1989a) "Richard T. Ely and the Contribution of Economic Research to National Housing Policy, 1920-1940," *Urban Studies* 26: 115-126
- (1989b) "Real Estate History: An Overview and Research Agenda," *The Business History Review* 63.2: 241-282
- (1991) "The Politics of Real Estate Cycles" *Business and Economic Histories* 20.2: 127-135.
- White House (2009) "Remarks of President Barack Obama – As Prepared for Delivery," Address to Joint Session of Congress, Tuesday, February 24th, 2009
- (2010) "Remarks by the President in State of Union Address," Office of the Press Secretary, United States Capitol, Washington, D.C., January 27, 2010
- (2011a) "Remarks by the President in State of Union Address," Office of the Press Secretary, United States Capitol, Washington, D.C., January 25, 2011
- (2011b) "Obama Administration Announces 14 Initial Partners in the Better Buildings Challenge," Office of the Press Secretary, June 30, 2011
- (2011c) "Obama Administration Announces 14 Initial Partners in the Better Buildings Challenge," Office of the Press Secretary, 30 June 2011

- (2012) "Remarks by the President in State of Union Address," Office of the Press Secretary, United States Capitol, Washington, D.C., January 24, 2012
- (2013a) "Remarks by the President in State of Union Address," Office of the Press Secretary, United States Capitol, Washington, D.C., February 12, 2013
- (2013b) "Policy Snapshot: Creating Jobs," Accessed 1 September 2013 at <http://www.whitehouse.gov/snapshots/creating-american-jobs>
- Wilhite, H.; Shove, E.; Lutzenhiser, L.; and Kempton, W. (2000) The Legacy of Twenty Years of Energy Demand Management: we know more about individual behavior but next to Nothing about demand, In *Society, Behavior, and Climate Change Mitigation*, E. Jochem et al., Eds: 109-126
- Wilk, R. (2002) Consumption, Human Needs, and Global Environmental Change, *Global Environmental Change* 12.1: 5-13
- Williams, James (1997) *Energy and the Making of Modern California*, Akron, OH: University Of Akron Press
- Williams, Raymond (1973) *The Country and the City*, New York: Oxford University Press
- Wilmarth, Arthur E., Jr. (2010-2011) "The Dodd-Frank Act: A Flawed and Inadequate Response to the Too-Big- to-Fail Problem," *Oregon Law Review* 89: 951-1058
- Wilson, Chris and Groth, Paul, Eds. (2003) *Everyday America: Cultural Landscape Studies After J.B. Jackson*, Berkeley, CA: University of California Press
- Wójcik, Dariusz (2011) "The Dark Side of NY-LON: Financial Centres and the Global Financial Crisis," University of Oxford Employment, Work and Finance Working Paper No. 11-12
- (2012) "The End of Investment Bank Capitalism? Financial jobs and power in the securities industry," *Economic Geography* 88.4: 345-368
- Wolf, Peter (1981) *Land in America*, New York: Pantheon Books
- Woody, Todd (2011a) "The Asset-Backed Security On Your Roof," *Forbes*, 5 July 2011
- (2011b) "Bundling the Sun," *Forbes Focus*, 18 July 2011
- (2012) "SolarCity Prices Its IPO But Is It A Solar Company Or A Financial Firm?" *Forbes*, 27 November 2012
- The World Bank (2007) *World Development Report 2008: Agriculture for Development*, The International Bank for Reconstruction and Development / The World Bank, Washington, DC
- (2010) *A City-Wide Approach to Carbon Finance*, Carbon Partnership Facility Innovation Series, Carbon Finance Unit, The World Bank, Washington, DC
- World Resource Institute (2009) "World Greenhouse Gas Emissions: 2005," 2 July 2009, accessed 4 September 2013 at <http://www.wri.org/chart/world-greenhouse-gas-emissions-2005>
- Wyly, Elvin; Moos, Markus; Hammel, Daniel; and Kabahizi, Emanuel (2009) "Cartographies of Race and Class: Mapping the class-monopoly rents of American subprime mortgage capital," *International Journal of Urban and Regional Research* 33.2: 332-354
- Yablon, Nick (2004) "The Metropolitan Life in Ruins: Architectural and Fictional Speculations in New York, 1909-19," *American Quarterly* 56.2: 308-347
- Zimmerer, K.S., (Ed). (2011) Special Issue: Geographies of Energy, *Annals of the Association of American Geographers* 101.4

Introduction

¹ World Bank (2010) *Cities and Climate Change: An Urgent Agenda*, summary accessed 10 March 2014 at

<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTURBANDEVELOPMENT/EXTUWM/0,,contentMDK:22781089~pagePK:210058~piPK:210062~theSitePK:341511,00.html>

² C40 Cities Global Leadership Group (2012) “Why Cities: Ending climate change begins in the city,” Info Graphic, accessed 10 March 2014 at <http://c40.org/ending-climate-change-begins-in-the-city>

³ World Bank programs include the Eco2 Cities Program, GHG Standard, City-wide approach to carbon finance, Energy Sector Management Assistance Program-Energy Efficient Cities Initiative (ESMAP-EECI), and the Global City Indicators Program. See World Bank (2010) for a summary. Another effort is UN Habitat’s Cities and Climate Change Initiative and partnership activities with UNEP. UNEP has also partnered with the Cities Alliance and the World Bank to carry out these programs. Other city and climate initiatives include efforts undertaken by the World Resources Institute, the Clinton Climate Initiative and ICLEI – Local Governments for Sustainability. C40 Cities combined with the Clinton Climate Initiative (CCI) in 2006. Another important program is the Rockefeller Foundation’s Asian Cities Climate Change Resilience Network (ACCCRN).

⁴ For other examples, see OECD (2010): “As the hubs of economic activity, cities drive the vast majority of the world’s energy use and are major contributors to global greenhouse gas emissions. Because they are home to major infrastructure and highly concentrated populations, cities are also vulnerable to the impacts of climate change, such as rising sea levels, warmer temperatures and fiercer storms. At the same time, better urban planning and policies can reduce energy use and greenhouse gas emissions and improve the resilience of urban infrastructure to climate change... cities and regions must play a key role in fostering the green growth agenda.” OECD (2010) *Cities and Climate Change*, OECD Publishing, Summary, accessed 11 March 2014 at <http://www.oecd.org/fr/gov/citiesandclimatechange.htm>. According to the Rockefeller Foundation (2014) “In the coming years, urban areas will increasingly play a major role in any climate change-related strategy, most especially because cities are where the interplay of climate risk and poverty lead to the direst consequences.” Rockefeller Foundation (2014) “Our Work: Climate Change Resilience. Asian Cities Climate Change Resilience Network,” accessed 10 March 2014 at <http://www.rockefellerfoundation.org/our-work/current-work/climate-change-resilience/asian-cities-climate-change-resilience>.

⁵ Albeit channeled into profoundly uneven geographies of industrialization, accumulation, energy consumption, and social and ecological sacrifice.

⁶ This analysis draws from an existing body of thought on environmental markets advanced by political ecologists, sociologists of markets, and other critical environmental scholars. Researchers have examined the labor of framing complex ecological systems as simplified, common, exchangeable quantities. They investigate how unruly natures challenge this simplification. And they argue that failed enclosures can both damage and destroy the actual natures involved and overturn the market schemes supposedly based on their successful manipulation. See, for example, Lohmann, L. (2005) Marketing and making carbon dumps: Commodification, calculation and counterfactuals in climate change mitigation, *Science as Culture* 14: 203-235 and (2009) “Toward a different debate in environmental accounting: The cases of carbon and cost–benefit,” *Accounting, Organizations and Society* 34.3-4: 499–534; Robertson, M.M (2006) “The nature that capital can see: science, state, and market in the commodification of ecosystem services,” *Environment and Planning D* 24: 367-387; Bumpus, Adam and Liverman, Diana (2008) “Accumulation by Decarbonization and the Governance of Carbon Offsets,” *Economic Geography* 84.2: 127-155; Mackenzie, Donald (2009) “Making

Things the Same: Gases, emissions rights and the politics of carbon markets accounting,” *Organization and Society* 34.3–4: 440–455; and Gómez-Baggethun, Erik; de Grootb, Rudolf; Lomasa, Pedro L.; and Montesa, Carlos (2010) “The History of Ecosystem Services in Economic Theory and Practice: From early notions to markets and payment schemes,” *Ecological Economics* 69.6: 1209-1218. These scholars draw on theoretical and historical accounts including Polanyi, Karl (2001 [1944]) *The Great Transformation* Boston, MA: Beacon Press (2nd Ed.) and Cronon, William (1983) *Changes in the Land: Changes in the Land: Indians, Colonists, and the Ecology of New England*, New York: Hill and Wang.

⁷ See especially critical literature on ecosystem services and carbon trading, as discussed in the note on environmental markets above. Also Boykoff, M.T., Bumpus, A., Liverman, D. and Randalls, S. (2009) Theorizing the carbon economy: introduction to the special issue, *Environment and Planning A* 41: 2299-2304; Bridge, G. (2011) Resource geographies 1: Making carbon economies, old and new, *Progress in Hum Geography* 35: 820-834.

⁸ For example, see work on “green grabs,” land grabs associated with environmental regulatory schemes. Scholars have increasingly examined the work that these schemes do, even in ostensible failure. See McAfee, Kathleen (1999) “Selling nature to save it? Biodiversity and green developmentalism,” *Environment and Planning D: Society and Space* 17.2: 133–54 and Fairhead, James; Leach, Melissa; and Scoones, Ian (2012) “Green Grabbing: A new appropriation of nature?” *Journal of Peasant Studies* 39.2: 237-261.

⁹ Although I do not directly consider very large corporate actors like Google in this account, future research should.

¹⁰ Measured according to the US Green Building Council’s Leadership in Energy and Environmental Design (LEED) Standard. Data from Green Building Information Gateway (GBIG) (2014a) “Places: San Francisco,” accessed March 11 2014 at <http://www.gbig.org/places/25804>.

¹¹ Again, common shorthand for US Green Building Council’s Leadership in Energy and Environmental Design standard.

¹² A term for this practice coined by the political scientist Alberta Sbragia that I will discuss in more depth in Chapter 8.

Chapter 1

¹ For more on the timber boom on the Pacific Slope, see Prudham, Scott (2004) *Knock on Wood: Nature as Commodity in Douglas-Fir Country*, New York: Routledge.

² Crown Zellerbach production history and statistics taken in February 2014 from the Lehman Brothers Collection - Contemporary Business Archives, in historical collections at the Harvard Business School’s Baker Library http://www.library.hbs.edu/hc/lehman/industry.html?company=crown_zellerbach_corp. More information on the Crown Zellerbach Corporation is available from the University of California’s Bancroft Library, which holds the corporation’s records from 1876 to 1986. See also The Bancroft Library Regional Oral History Office’s 1979 publication *Crown Zellerbach: Timber, technology and corporate development in the Pacific Northwest, 1920 to 1965* and *Recollections: interviews with William J. Zellerbach and Stephen A. Zellerbach and Bancroft’s Zellerbach Family Papers*. In addition, Oregon State University’s archive holds a collection of photographs of Crown Zellerbach’s historical operations between 1899 and 1980, primarily from its paper mill in Lebanon, Oregon, but also from additional regional divisions and from the San Francisco headquarters.

³ See, for example, Walker, Richard (2001) “California’s Golden Road to Riches: Natural Resources and Regional Capitalism, 1848-1940,” *Annals of the AAG* 91.1: 167-99; Igler, David (2000) “The Industrial Far West: Region and Nation in the Late Nineteenth Century,” *The Pacific Historical Review*, 69.2: 159-192.

⁴ Crown Zellerbach established its first headquarters in 1930 at 343 Sansome Street, after the company formed in the 1928 consolidation of the Crown Willamette Paper Company and the Zellerbach Paper Company, which city directories from 1922 and 1924 show had had offices at 248 Battery and Battery and Jackson Streets. The Sansome Street building, originally built in 1908 and remodeled for Crown Zellerbach in 1929-1930, still stands today. It is now occupied by the Bank of California. See Dinkelspiel Cerny, Susan (2007) *An Architectural Guidebook to San Francisco and the Bay Area*, Layton, Utah: Gibbs Smith.

⁵ Walker (2001); See also Brechin, Gray (2006) *Imperial San Francisco: Urban Power, Earthly Ruin, With a New Preface*, Berkeley, CA: University of California Press.

⁶ Michael Kazin provides a good account of these early twentieth century building booms. Kazin, Michael (1988) *Barons of Labor: The San Francisco Building Trades and Union Power in the Progressive Era*, Champaign, IL: University of Illinois Press.

⁷ SOM site on One Bush Plaza.

⁸ The classic account of this is Chester Hartman's *City for Sale*. See Hartman, Chester (2002) *City for Sale: The Transformation of San Francisco, Revised and Updated Edition*, Berkeley, CA: University of California Press. And see DeLeon, Richard Edward (1992) *Left Coast City: Progressive Politics in San Francisco 1975-1991*, Lawrence, KS: University Press of Kansas and Walker, Richard (2008a) *The Country in the City: The greening of the San Francisco Bay Area*, Seattle: University of Washington Press.

⁹ For a particularly incisive discussion of these practices, see Weber, Rachel (2002) "Extracting Value from the City: Neoliberalism and urban redevelopment," *Antipode* 34.3: 519-540

¹⁰ Weber (2002). The literature on "growth machines" is reviewed in Logan, John R. and Molotch, Harvey L. (2007 [1987]) *Urban Fortunes: The Political Economy of Place, twentieth Anniversary Edition*, Berkeley, CA: University of California Press.

¹¹ After a series of further changeovers, the former Crown Zellerbach's disposal paper products now make up part of the corporate empire belonging to the Koch brothers, infamous for funding not only the Tea Party movement of the late 2000s but an the unsuccessful 2010 campaign to overturn California's pioneering greenhouse gas reduction legislation via California ballot initiative (Proposition 23).

¹² San Francisco Preservation Bulletin No. 9: *San Francisco Landmarks*

¹³ In his important book *How Buildings Learn*, Stewart Brand works through the effects of internal form and process and time on the different potential "lifetimes" of separate building elements: building systems, interiors, shells, cladding, and more. Borrowing from the architect Michael Duffy, he calls this concept "shearing layers." Brand, Stewart (1995) *How Buildings Learn: What Happens After They're Built*, New York: Penguin Books.

¹⁴ Renovated (asbestos abatement and sprinkler upgrade) in 1990. US Green Building Council (USGBC) (2014) "Directory: One Bush Street" Accessed March 11 2014 at <http://www.usgbc.org/projects/one-bush-street>.

¹⁵ See, for example, Solnit, Rebecca and Schwartzberg, Susan (2001) *Hollow City: Gentrification and the Eviction of Urban Culture*, New York: Verso.

¹⁶ Temple, James (2003) "Investment bank to double space with S.F. lease, *San Francisco Business Times* 22 June 2003

¹⁷ For example, see work by Ashby Monk and Adam Dixon on sovereign wealth funds and substantial research by Gordon Clark and associated researchers on pension funds. For example, Dixon, Adam D. and Monk, Ashby H. B. (2012) "Rethinking the sovereign in sovereign wealth funds," *Transactions of the Institute of British Geographers* 37.1: 104-117 and Clark, Gordon (2000) *Pension Fund Capitalism*, New York: Oxford University Press

¹⁸ See debates on property as financial asset. E.g., Walker, Richard (1974) Urban ground rent: building a new conceptual framework, *Antipode* 6.1: 51-58; Harvey, David (1982) *The Limits to Capital*, New York: Verso, Haila, Anne (1988) "Land as a Financial Asset: The theory of urban

rent as a mirror of economic transformation,” *Antipode* 20.2: 79-101, Christophers, Brett (2011) “Revisiting the Urbanization of Capital,” *Annals of the Association of American Geographers* 101.6: 1347-1364.

¹⁹ See Carol Willis on this older strategy. Willis, Carol (1995) *Form Follows Finance: Skyscrapers and Skylines in New York and Chicago*, Princeton, NJ: Princeton Architectural Press. For the modern revolution in commercial real estate, see Fox-Gotham, Kevin (2006) “The Secondary Circuit of Capital Reconsidered: Globalization and the U.S. real estate sector,” *American Journal of Sociology* 112.1: 231-275; Downs, Anthony (1985) *The Revolution in Real Estate Finance*, Brookings Institution, Washington, DC; Fainstein, Susan (2001) *The City Builders: Property Development in New York and London, 1980-2000, Second Edition, Revised*, Lawrence, KS: University Press of Kansas

²⁰ As many writers on the subprime crisis have chronicled. See especially Brenner, Robert (2009) What’s Good for Goldman Sachs is Good for America,” Prologue, *The Economics of Global Turbulence*, Spanish Edition, pp. 34-73.

²¹ They are typically able to access capital more cheaply than traditional private real estate companies.

²² Office of the Assessor-Recorder, City & County of San Francisco, *Annual Report*, 2006, 2007, 2008, 2009, 2010, 2011, 2012

²³ Dineen, J.K. (2013) “The REITs that ate San Francisco,” *San Francisco Business Times* 14 November 2013, updated 15 November 2013

²⁴ See Hartman (2002) on historical role of Shorenstein and his investments.

²⁵ Tishman Speyer acquired this property in 2004, along with seven other buildings in San Francisco. Emporis (2014) “One Bush Plaza,” Accessed 11 March 2014 at <http://www.emporis.com/building/one-bush-plaza-san-francisco-ca-usa>.

²⁶ Tishman Speyer (2014) “Our Global Properties,” Accessed 11 March 2014 at <http://www.tishmanspeyer.com/#!/properties>

²⁷ Bagli, Charles V. (2011) “Real Estate Developers Prosper Despite Defaults,” *New York Times*, 1 January 2011; Dealbook (2010) “Stuyvesant Town’s Lenders Take Over Property,” *New York Times*, 26 October 2010. See also Bagli’s longer 2013 book on Tishman Speyer and the Stuyvesant Town development. Bagli, Charles V. (2013) *Other People’s Money: Inside the Housing Crisis and the Demise of the Greatest Real Estate Deal Ever Made*, New York: Dutton Adult.

²⁸ See, for example, Harvey (1982); Storper, Michael and Walker, Richard (1989) *The Capitalist Imperative: Territory, Technology, and Industrial Growth*, New York: Basil Blackwell; Arrighi, Giovanni (2010) *The Long Twentieth Century: Money, Power and the Origins of Our Times, New and Updated Edition*, New York: Verso.

²⁹ See, for example, Smith, Neil (1996) *The New Urban Frontier: Gentrification and the Revanchist City*, New York: Routledge; Weber (2002).

³⁰ See, for example, Fainstein (2001), Fox-Gotham (2006), and a major wave of work in the aftermath of the subprime collapse. For example, Brenner (2009); Newman, Kathe (2009) “Post-Industrial Widgets: Capital Flows and the Production of the Urban,” *International Journal of Urban and Regional Research* 33.2: 314-331; Sassen, Saskia (2009) (2009) “When Local Housing Becomes an Electronic Instrument: The global circulation of mortgages — a research note,” *International Journal of Urban and Regional* 33.2: 411-426; Wyly, Elvin; Moos, Markus; Hammel, Daniel; and Kabahizi, Emanuel (2009) “Cartographies of Race and Class: Mapping the class-monopoly rents of American subprime mortgage capital,” *International Journal of Urban and Regional Research* 33.2: 332-354, Christophers, B. (2010) “On Voodoo Economics: Theorising relations of property, value and contemporary capitalism,” *Transactions of the Institute of British Geographers* 35.1: 94-108.

³¹ See, for example, Brechin (2001); Walker (2008a).

³² San Francisco Department of the Environment (2014a) “Green Building,” accessed 11 March 2014 at <http://www.sfenvironment.org/buildings-environments/green-building>. Given the difficulties in measuring life cycle costs, many of the numbers likely encompass the operation of existing buildings only. Although the city does not provide references, it is likely drawing these numbers from the USGBC’s (2012) “Green Building Facts.” (Ashley Katz), accessed 11 March 2014 at <http://www.usgbc.org/Docs/Archive/General/Docs18693.pdf>. In turn, the USGBC’s electricity use figures come from the US Department of Energy and only include buildings’ current operation. Department of Energy (2011). *Buildings Energy Data Book*. See section, “Buildings Share of Electricity Consumption/Sales.” Its estimate for waste ultimately comes from a 1995 Worldwatch Report: Roodman, David Malin and Lenssen, Nicholas (1995) *Worldwatch Paper 124: A Building Revolution: How Ecology and Health Concerns are Transforming Construction*, Washington, DC: Worldwatch Institute.

³³ U.S. Environmental Protection Agency (2014) *Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012*, Washington, DC: U.S. Environmental Protection Agency

³⁴ See, for example, Knuth, Sarah (2010) “Addressing place in climate change mitigation: Reducing emissions in a suburban landscape,” *Applied Geography* 30.4: 518–531.

³⁵ See, for example, Walker, Richard (1995) “Landscape and city life: four ecologies of residence in the San Francisco Bay Area,” *Cultural Geographies* 2.1: 33-64; Shi, David E. (2001) *The Simple Life: Plain Living and High Thinking in American Culture*, Athens, GA: University of Georgia Press; Wollenberg, Charles (2008) *Berkeley: A City in History*, Berkeley, CA: University of California Press.

³⁶ Turner, Fred (2006) *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism*, Chicago: University of Chicago Press; Kirk, Andrew G. (2007) *Counterculture Green: The Whole Earth Catalog and American Environmentalism*, Lawrence, KS: University Press of Kansas. This is of course only one part of a broader environmental movement in the 1960s and 1970s. For accounts of these other arenas and strategies in the Bay Area see Walker (2008a). In San Francisco, these movements aligned a complex set of interests behind growth control. Some organizing campaigns protested downtown Manhattanization and advocated height limits and historic preservation, others fought suburban sprawl on the margins and pushed development restrictions like the California Environmental Quality Act (CEQA). See Hartman (2002, DeLeon (1992), and Walker (2008a). As these scholars suggest, growth control had complex class politics and often played into common structures of feeling with the tax revolt, which organized at the same time. For example, elements of both movements advocated growth control and arguments for the benefits of austerity, broadly defined. For some discussion of these concepts in the California context see Mike Davis’s chapter “Homegrown Revolution” in Davis, Mike (1990) *City of Quartz: Excavating the future in Los Angeles*, New York: Vintage/Random House and Schrag, Peter (1998, 2004) *Paradise Lost: California's Experience, America's Future*, Berkeley, CA: University of California Press.

³⁷ For example, Lloyd Kahn’s book *Shelter*. Kahn, Lloyd and Easton, Bob, Eds. With Bacon, Joe, Fulton, Jack, Hartmann, Ilka, and Dixon Pam (1973), *Shelter*, Bolinas, CA: Shelter Publications. This work focused on things like yurts that were useful for back to the land-ers, the American and Canadian movement of the late 1960s to mid 1970s that was influentially shaped by the Whole Earth Catalog. Later, see Stewart Brand’s *How Buildings Learn*, Brand (1995) also adapted into a BBC miniseries. Another influence on this thought is Viktor Olgyay’s *Design With Climate*. Olgyay, Victor (1963) *Design With Climate: Bioclimatic Approach to Architectural Regionalism*, Princeton, NJ: Princeton University Press.

³⁸ *The Domebook*. Kahn, Lloyd (1970) *The Domebook*. Ashland, OR: Pacific Domes. Baldwin was a student of Fuller’s and invented the later design, “pillow domes.”

³⁹ Andrew Kirk (2007)

-
- ⁴⁰ For an early critique, see Walker, Richard and Large, David B. (1974) "The Economics of Energy Extravagances," *Ecological Law Quarterly* 963-986. See also Andrew Kirk (2007).
- ⁴¹ Kotler, Steven (2008) "The Whole Earth Catalog Effect," *Plenty* magazine, November 2008: <http://www.mnn.com/lifestyle/arts-culture/stories/the-whole-earth-catalog-effect>, This article provides an oral history of the movement, reproducing parts of interviews with many key players.
- ⁴² Lovins, Amory (1976) "Energy Strategy: The Road Not Taken," *Foreign Affairs* 55.1: 65-96
- ⁴³ California's first energy standard for appliances was passed in 1974. In 1988, the federal government adopted them as a national code. The federal code preempts state regulations, but California has continued to unroll codes in appliances and equipment not yet covered by federal rules. 1974 California rules covered refrigerators, freezers, and room and central air conditioners. 1983 California rules expanded regulation to space heaters and water heaters. See Battles, Stephanie (2008) "Historical Perspective on Energy Codes and Appliance Standards," Presentation at *Energy Information Administration 2008 Energy Conference: 30 years of Energy Information and Analysis*, Washington, DC, April 7- 8, 2008. Battles was then the director of the EIA's Energy Consumption Division. See also analyses by the ACEEE and ECEEE, for example Nadel, S. (2003) "Appliance & Equipment Efficiency Standards in the US: Accomplishments, next steps and lessons learned," ECEEE 2003 Summer Study, <http://www.eceee.org>.
- ⁴⁴ California Public Utility Commission (CPUC) (2007) "Energy Efficiency," accessed 11 March 2014 at <http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/>; California Energy Commission (CEC) (2012) *Staff Report: Comprehensive Energy Efficiency for Existing Buildings Scoping Report*, August 2012, CEC-400-2012-015; CEC (2014) "California's Energy Efficiency Standards Have Saved \$74 Billion," Accessed 11 March 2014 at <http://www.energy.ca.gov/efficiency/savings.html>.
- ⁴⁵ California simultaneously pioneered local government financialization. The state passed Proposition 13 by ballot initiative in 1978, the same year that Governor Brown signed Title 24. Prop 13 helped spark the nationwide Tax Revolt, a foundational moment in the rise of neoliberalism. See, for example Sbragia, Alberta M., Ed. (1983) *The Municipal Money Chase: the Politics of Local Government Finance*, Boulder, CO: Westview Press and Schrag (1998, 2004).
- ⁴⁶ It has also marked ongoing giveaways to commercial property owners in California, as the burden of taxation has shifted to residential homeowners: an important factor in ongoing speculative real estate development in places like San Francisco. For example, see Office of the Assessor-Recorder (2006-2012), which has tracked the development of this disparity for years. Many commentators on the passage of Prop 13 note the irony of this treatment of large commercial property for an initiative rhetorically aimed at homeowners, although notable too is the fact the Howard Jarvis, who spearheaded its campaign, was a lobbyist for the Los Angeles Apartment Owners Association. See Davis (1990), Schrag (1998, 2012) and also Lo, Clarence Y. H. (1995) *Small Property versus Big Government: Social Origins of the Property Tax Revolt, Expanded and Updated edition*, Berkeley, CA: University of California Press and Self, Robert O. (2003) *American Babylon: Race and the Struggle for Postwar Oakland*, Princeton, NJ: Princeton University Press.
- ⁴⁷ Turner (2002) and see Saxenian, A.L. (1996) *Regional advantage: culture and competition in Silicon Valley and Route 128*.
- ⁴⁸ Steve Jobs, Commencement Address, Stanford University, June 12, 2005, available at <http://news.stanford.edu/news/2005/june15/jobs-061505.html>
- ⁴⁹ Hawken, Paul, Lovins, Amory and Lovins, L. Hunter (2008) *Natural Capitalism: Creating the Next Industrial Revolution*, Washington, DC: US Green Building Council.
- ⁵⁰ For an early critical commentary, see Prudham, Scott (2009) "Pimping climate change: Richard Branson, global warming, and the performance of green capitalism," *Environment and Planning A* 41:1594-1613.

-
- ⁵¹ For more discussion of this dynamic, see Prudham, Scott and McCarthy, James (2004) “Neoliberal nature and the nature of neoliberalism,” *Geoforum* 35.3: 275-283.
- ⁵² See, for example, Prudham and McCarthy (2004).
- ⁵³ Building Design & Construction (2003) White Paper on Sustainability, November 2003
- ⁵⁴ In 2013 ARCHITECT magazine’s Top 50 in Sustainability recognized it as its top firm. See http://www.architectmagazine.com/architects/architect-50--sustainability.aspx?utm_source=newsletter&utm_content=jump&utm_medium=email&utm_campaign=ANW_091113&day=2013-09-11. Other SF offices on the list include Perkins+Will and HOK, for example.
- ⁵⁵ Although the standard has since been incorporated in policies, about which more later.
- ⁵⁶ Cidell, Julie (2009) “Building Green: The Emerging Geography of LEED™-Certified Buildings and Professionals,” *The Professional Geographer* 61.2: 200-215. San Francisco-Oakland was 4th on a per capita basis, with New York City much farther down.
- ⁵⁷ Cidell (2009).
- ⁵⁸ Green Building Information Gateway (GBIG) (2014a) “Places: San Francisco,” accessed March 11 2014 at <http://www.gbig.org/places/25804>
- ⁵⁹ They likely build on a longer history of tension between architecture and building engineering. Many scholars argue that architecture had relegated these energy and environmental system questions to other disciplines like building science, and generally treated them as inferior and secondary fields of practice; a tradition highly problematic as these considerations have become central dimensions of social concern and topics of frontier technological and economic interest. See, for example, Banham, Reyner (1969, 1984) *The Architecture of the Well-Tempered Environment*, 2nd Revised Edition, Chicago: University Of Chicago Press, Brand (1995), Loeb, Carolyn S. (2001) *Entrepreneurial Vernacular: Developers' Subdivisions in the 1920s*, Baltimore, MD: Johns Hopkins University Press, Stevens, G. (2002) *The Favored Circle: The Social Foundations of Architectural Distinction*, Cambridge, MA: The MIT Press.
- ⁶⁰ See, for example, Walker (2008a) on the suburban fringe as a site for galvanizing environmentalist protest.
- ⁶¹ For example, the lawsuits brought in the late 2000s by Henry Gifford. These critiques point to the large weight of heating and cooling space in building energy footprints. Strong critics of LEED™ like Gifford have argued that top energy performance and carbon neutrality are virtually impossible to achieve for large buildings, and they argue that the palatial size of some LEED™-certified homes thus represents significant “greenwashing,” given the gravity of climate change and other fossil energy-linked environmental destabilizations.
- ⁶² Battles (2008).
- ⁶³ Ideas of technological rents/super-profits and their geographic dimensions expounded by Storper and Walker (1989).
- ⁶⁴ Typically they did not work on small structures like homes. The average cost for their large-scale, specialized interventions was ~\$350,000 and they have been long dominated by the MUSH sector (public buildings and institutional space), something like 55-65 percent or more over the years of their operation.
- ⁶⁵ CEC (2012)
- ⁶⁶ CEC (2012) If “California is to meet its energy efficiency goals for 2025, it will need to consider the substantial contributions of older buildings. Similar to the residential sector, the nonresidential sector is dominated by buildings that predate California’s energy code for new construction; Energy Commission projections indicate that, by 2022, nearly 50 percent of buildings will be pre-1970 and 74 percent pre-1990 (Figure 5). Within the nonresidential sector, there is a great variety of building types, and each contains a different profile of energy consumption.”

⁶⁷ Rahim, Saqib (2009) “Energy Savers Try to Rebuild Their 'Brands' With Government Contracts,” *New York Times* 20 August 2009

⁶⁸ Goldman, C., Dayton, D. (1996) “Future Prospects for ESCOs in a Restructured Electricity Industry,” *Proceedings of the 1996 ACEEE Summer Study*, Washington, DC: American Council for an Energy-Efficient Economy, Vol. 10, pp. 59–69; Hirsh, Richard F. (1999) *Power Loss: The Origins of Deregulation and Restructuring in the American Electric Utility System*, Cambridge, MA: The MIT Press; Vine, E., Nakagami, H., Murakoshi, C. (1999) “The Evolution of the US Energy Service Company (ESCO) Industry: From ESCO to super ESCO,” *Energy-The International Journal* 24.6: 479–492;

Duane, T.P. (2002) Regulation’s rationale: learning from the California energy crisis, *Yale Journal on Regulation* 19.2: 471-540; Goldman, C., Osborn, J., Hopper, N., Singer, T. (2002) “Market Trends in the US ESCO Industry: Results from the NAESCO Database Project, LBNL-49601,” Lawrence Berkeley National Laboratory, Berkeley, CA.

⁶⁹ Goldman et al. (2002); Saqib (2009)

⁷⁰ Since shortly after the 2001 energy crisis organizers in San Francisco and the Bay Area have tried to take advantage of the new openings and reinforced skepticism about PG&E to implement community choice aggregation programs, which have explicitly focused on renewable power supply but with uncertain outcomes for the organization of energy efficiency and DSM policies in California. This kind of program was enabled in 2002, when the state allowed municipalities to choose alternative electricity providers. Marin County was California’s first municipality to create a community choice aggregation program. It contracts with Shell Energy North America for its renewable power supply. San Francisco was meant to approve its own program, CleanPowerSF, in 2013 after a long organizing drive that started in 2004; it has since run into troubles with the CPUC. CleanPowerSF aimed at city-owned renewable generation capability and a break on PG&E’s monopoly in the market. It also talked about sourcing from Shell. These public programs speak to a much longer history of bids for public power and resistance to utilities, a struggle that shaped Progressive Era politics before the long period of relative stability in the mid-twentieth century. As in this previous era PG&E has bitterly fought current efforts. See Coté, John (2012) “S.F. weighing green alternative to PG&E,” *San Francisco Chronicle* 16 September 2012 and Lagos, Maris and Baker, David R. (2013) “CleanPowerSF remains mired in politics,” *San Francisco Chronicle* 12 November 2013.

⁷¹ California’s climate efforts have helped propel a fresh wave of experimentation in energy and environmental markets, one of national and global importance. AB 32’s policy mechanisms include a statewide greenhouse gas emissions market, the world’s second largest in emissions covered after the European Union’s Emissions Trading System (ETS). When California’s cap-and-trade program formally came into effect in 2013, it assigned allowances to large electric power plants and large industrial plants, entities who emit 25,000 metric tons of carbon dioxide equivalent (CO₂e) or more annually. Once it is extended to fuel distributors in 2015, it is projected to directly include 360 businesses in California, and nearly 85 percent of the state’s total emissions. It requires these companies to hold enough allowances to cover their own emissions; they may buy emissions on the market to achieve this goal, or sell allowances if they have excess in a year. Total allowances decrease over time. For a summary and analysis of the policy, see Center for Climate and Energy Solutions (2014) “California Cap-and-Trade: Program Summary,” Policy brief, January 2014, available at <http://www.c2es.org/docUploads/calif-cap-trade-01-14.pdf>.

⁷² Lohmann (2005, 2009); Bumpus and Liverman (2008); Mackenzie (2009)

⁷³ Prop 23, which researchers found Koch brothers backing funding in, at the same time as they were funding the Tea Party. Steyer was the single largest backer of the “No on 23” campaign. He also was a design and the major sponsor, the tune of \$21.9 million, of a successful 2012 ballot initiative, Proposition 39, that funded green collar jobs through closing a tax loophole regarding

California businesses conduction operations out of state. E.g., see Marois, Michael B. (2012) "California Ballot Spending Led by Munger, Steyer, Joseph," *Bloomberg* 27 August, 2012. Steyer has since pledged in a media splash in 2014 to fund a series of pro-climate change mitigation advertisements in the coming election cycle. Already a major California Democratic Party funder, he is courting a potential political career.

⁷⁴ Katz, Ashley (2012) "USGBC Launches Green Building Information Gateway," USGBC Media, 16 November 2012, available at <http://www.usgbc.org/articles/usgbc-launches-green-building-information-gateway>. See also: Piperato, Susan (2013) "USGBC Offers New Tools for Investors to Track Green Buildings," *National Real Estate Investor* 11 March 2013, available at <http://nreionline.com/expert-qampas/usgbc-offers-new-tools-investors-track-green-buildings>,

⁷⁵ Green Buildings Information Gateway (GBIG) (2014b) "1 Bush St," accessed 11 March 2014 at <http://www.usgbc.org/articles/usgbc-launches-green-building-information-gateway>

⁷⁶ USGBC site for One Bush Plaza; USGBC (2014). Not all buildings had this level of narrative information; that One Bush Plaza did is another reason that I chose it as an example.

⁷⁷ One Bush Plaza houses the San Francisco office of HOK (formerly Hellmuth, Obata + Kassabaum), the global design, architecture, engineering and planning firm.

⁷⁸ Tishman Speyer has announced plans to re-certify the building in 2014.

⁷⁹ General Overview on One Bush Plaza, USGBC (2014).

⁸⁰ APS - *Think Efficiency*

⁸¹ According to Tishman Speyer's corporate sustainability report. Tishman Speyer (2012) *Sustainability*, p. 14, available at <http://d14xrzr7ffwptb.cloudfront.net/prod/pdf/sustainability-report-2012.pdf>

⁸² GBIG (2014b)

⁸³ Hartman (2002); Self (2003); Walker (2008a)

⁸⁴ Energy (24 points); Sites (21 points.). The building's total score was 83 points. And 15 of the "Site" points were for alternative transportation.

⁸⁵ Kristin Walker, Consultant, Waypoint Building Group, USGBC (2014)

⁸⁶ For some discussion, see Wang, Nora, Taylor, Cody, McCabe, Molly, and Tanner, Hayden (2012)

"DOE Commercial Building Energy Asset Rating: Market Research and Program Direction," *Proceedings, 2012 ACEEE Summer Study on Energy Efficiency in Buildings*, Washington, DC: ACEEE.

⁸⁷ Particularly given increasing competition between cities. On this trend, see, for example, Harvey, David (1989) "From Managerialism to Entrepreneurialism: The Transformation in Urban Governance in Late Capitalism," *Geografiska Annaler. Series B, Human Geography* 71.1: 3-17. Bill Fulton discusses how Prop 13 can make this competition particularly tense in California, although he focuses particularly on suburban commercial real estate dynamics in terms of sales tax revenue-generators like shopping malls and car dealerships. See Fulton, William B. (1999) *Guide to California Planning*, Point Arena, CA: Solano Press Books.

⁸⁸ Steve Hanus, Owner, Tishman Speyer Property, USGBC site on One Bush Plaza, USGBC (2014).

⁸⁹ Ann Akhromtsev, Project Manager, Tishman Speyer Property, USGBC (2014).

⁹⁰ Overview, USGBC (2014).

⁹¹ Jonathan Flaherty, Owner, Tishman Speyer Property, USGBC (2014). See also Kristin Walker Consultant, Waypoint Building Group, USGBC (2014): "Because of... Tishman Speyer's portfolio approach, we were able to ultimately go for Platinum. Through this portfolio approach, Tishman Speyer had integrated a number of buildings on the West Coast at once to go through the certification process. This meant that all of the projects were on weekly phone calls together, sharing their experiences and problem solving together. As a result, they were able to talk about and discover efficient solutions together. A key moment was when there was a lot of talk about

fitting and fixture LEED™ water credits for another building across the street going for LEED™ at the same time. We were able to apply those same solutions to One Bush with a lot less time spent on the research portion of it. Because of that, One Bush got up to almost 75 LEED™ credits, which wasn't expected, and the team then decided that they wanted to consider going to Platinum.”

⁹² Tishman Speyer (2012)

⁹³ Steve Hanus, Owner, Tishman Speyer Property, USGBC (2014).

⁹⁴ Horowitz, Noah (2012) “New California building code to slash energy bills by billions,” 31 May 2012, *Greenbiz.com*: “According to the CEC estimates, Californians can expect energy savings of 25 percent for homes, 30 percent for commercial buildings, and 14 percent for low rise multifamily buildings.” And see CEC (2012).

⁹⁵ CEC (2012).

⁹⁶ An alternate, more loaded term would be manufactured obsolescence, deviating a little from more standard meaning of built for quick failure

⁹⁷ Urban Land Institute (2010) *New Tools. New Rules. Climate Change, Land Use, and Energy 2010*. Washington, D.C.: Urban Land Institute; Jones Lang LaSalle (2013a) *Global Sustainability Perspective* and (2013b) *From Obsolescence to Resilience*; PriceWaterhouseCoopers LLC and Urban Land Institute (2013) *Emerging Trends in Real Estate® 2013*.

⁹⁸ ESPM scores range from 1 to 100, with a score of 50 being the average. A score of 75 or higher is needed to apply for an Energy Star label

⁹⁹ Also California and Washington State.

¹⁰⁰ Twenty percent below 1990 levels by the year 2012. See Board of Supervisors, City and County of San Francisco (2004) *Resolution No. 158-02, Climate Action Plan for San Francisco: Local Actions to Reduce Greenhouse Gas Emissions*, September 2004.

¹⁰¹ (The article does not specify metric tons, but that would be normal.) Buchanan, Wyatt (2008), “Newsom signs strict green building codes into law” *San Francisco Chronicle* 5 August 2008.

¹⁰² In Chapter 13C of the San Francisco Building Code, San Francisco adopted the 2010 statewide California Green Building Standards Code and added its own extra amendments.

¹⁰³ It was phased in first as voluntary standards in 2008, made mandatory in 2010, with an extra level of above-code voluntary measures, and continued to be amended in 2012.

¹⁰⁴ Buchanan (2008)

¹⁰⁵ Cidell (2009)

¹⁰⁶ LEED™ commercial interiors (LEED™ CI) not included. Data from GBIG.org on San Francisco, GBIG (2014a).

¹⁰⁷ See Cidell (2009) for a previous public sector dominance of green building. According to GBIG (2014a), today buildings owned by non-profits made up nine percent of San Francisco square footage certified, local government six percent, and federal government five percent.

¹⁰⁸ Existing Buildings (EBOM) and New Design and Construction (NC) counted. Commercial Interiors (CI) and other LEED classifications not included.

¹⁰⁹ According to the U.S. EPA State and Local Climate and Energy Program (2013) “California,” accessed 11 March 2014 at

<http://www.epa.gov/statelocalclimate/state/tracking/individual/ca.html>,

“the California PBF is \$0.003/kWh, capped at 3% of a customer's bill; the funds are administered by the California Energy Commission and the Public Utilities Commission to support renewable energy and energy efficiency programs, with \$913.2 million (\$567 million for energy efficiency) available from 2006-2008. In August 2000 the PBF received a 10 year extension with an adjustment for inflation.” But see discussion in California Public Utility Commission (CPUC) (2008) *California Long-Term Energy Efficiency Strategic Plan*, September 2008, D.08-09-040 and CEC (2012) on ongoing funding.

¹¹⁰ SF Energy Watch is funded by California utility ratepayers and administered by Pacific Gas and Electric Company in collaboration with the City and County of San Francisco and under the auspices of the CPUC. The CPUC directed Pacific Gas and Electric Company to form partnerships with local governments to implement this and similar programs throughout. In San Francisco, the program is being carried out by the Department of the Environment

¹¹¹ CEC (2012)

¹¹² CEC (2012)

¹¹³ CEC (2012)

¹¹⁴ CPUC (2008). See also White House (2009) “Executive Order: Federal Leadership in Environmental, Energy, and Economic Performance,” Office of the Press Secretary, 5 October 2009: “By Executive Order 13514, U.S. President Barack Obama mandated that 100% of all new federal buildings be zero-net-energy by 2030.”

¹¹⁵ CEC (2012)

¹¹⁶ Assembly Bill 758 (Skinner, Chapter 470, Statutes 2009). It was sponsored by Assemblymember Nancy Skinner (D-Berkeley). Elected to the Assembly in 2008, Nancy Skinner also co-founded ICLEI-Local Governments for Sustainability and coordinated the Cities for Climate Protection Campaign. In addition, in 1997 she led the US Mayors’ delegation to the Kyoto Protocol. In addition, in 2005 she coordinated the Summit between CEOs, which included Governor Schwarzenegger and which helped lead to the signing of California’s Global Warming Solutions Act (AB 32). For more on ICLEI’s Cities for Climate Protection Campaign, see <http://archive.iclei.org/index.php?id=10829>

¹¹⁷ CEC (2012)

¹¹⁸ The city also has ordinances mandating commercial lighting retrofits and water conservation measures. The San Francisco Commercial Lighting Efficiency Ordinance requires that fluorescent lighting in non-residential commercial buildings be upgraded by 2011; water conservation measures will be due in 2017.

¹¹⁹ Steve Hanus, Owner, Tishman Speyer Property, USGBC (2014)

¹²⁰ Kristin Walker, Consultant, Waypoint Building Group, USGBC (2014)

¹²¹ Tishman Speyer (2012)

¹²² Overview, USGBC (2014)

¹²³ Tishman Speyer (2012)

¹²⁴ Pacific Carbon Exchange (2010) *Creating a California Energy Efficiency Market: An Energy Efficiency Credits (EEC) Protocol in California:*

<http://www.pcarbx.com/PressDownloads/PcarbXEECMktPlanPrecis.pdf>

¹²⁵ Pike Research (2010) *Green Building Certification Programs*

¹²⁶ Pike Research (2012b) *Energy Efficiency Retrofits for Commercial and Public Buildings* updates Pike Research (2011) *Energy Efficient Buildings: Global Outlook* numbers on new and retrofitted commercial buildings to suggest that the global retrofit market alone for commercial and public buildings will expand from \$80.3 billion in 2011 to \$151.8 billion by 2020. Considering both new construction and energy retrofits, Pike Research (2012a) *Energy Efficient Homes* projects an additional global residential market of \$84 billion by 2020 (including in this total homes that exceed the 2009 International Energy Conservation Code (IECC) by 15% on a kilowatt-hour per square foot basis).

¹²⁷ Tishman Speyer (2012), p. 10

¹²⁸ Popovec, Jennifer Duell (2012) “NAREIT Evaluates New Sustainability Ranking Platform,” *National Real Estate Investor* 16 May 2012; Piperato (2013)

¹²⁹ Piperato, Susan (2013); Hirsch, Matthew (2013) “Coming soon: Sustainability ratings for real estate investments” *GreenBiz.com* 7 March 2013

¹³⁰ See, for example, the HIP portfolio: <http://hipinvestor.com/for-investors/hip-portfolio/hip-sustainable-real-estate-portfolio/>. See also Sarasin Sustainable Real Estate Equity - Global (EUR):

<http://www.bloomberg.com/quote/SARRESB:LX>: “an open-end fund incorporated in Luxembourg. The Fund's objective is long-term capital appreciation. The Fund invests worldwide in shares and equity securities of companies whose activities are concentrated in the real estate sector and which includes ecological and social sustainability as part of business operations.”

¹³¹ San Francisco Department of the Environment (2014b) “Financing,” accessed 11 March 2014 at <http://www.sfenvironment.org/buildings-environments/green-building/policy-incentives-and-resources/financing>

¹³² Commentary on market environmentalism in the US more broadly has emphasized that, like neoliberal free market policies in general, these rhetorical pullbacks of the state actually necessitate state rollout as well, and are just transmuted forms of state power, drawing from Polanyi (1944 [2001]). See especially Peck, Jamie and Tickell, Adam (2002) “Neoliberalizing Space,” *Antipode* 34.3: 380-404.

¹³³ CEC (2012)

¹³⁴ See Dilworth, Richardson and Stokes, Robert (2013) “Green growth machines, LEED ratings and value free development: the case of the Philadelphia property tax abatement,” *Journal of Urbanism: International Research on Placemaking and Urban Sustainability* 6.1: 37-51. See also Kear, Mark (2007) “Spaces of Transition, Spaces of Tomorrow: Making a sustainable future in Southeast False Creek in Vancouver,” *Cities* 24: 324–334; Quastel, Noah (2009) “Political Ecologies of Gentrification,” *Urban Geography* 30.7: 694-725; Checker, Melissa (2011) “Wiped Out by the ‘Greenwave’: Environmental gentrification and the paradoxical politics of urban sustainability,” *City & Society*, 23.2: 210–229. In general, this scholarship has looked at “green gentrification” primarily in terms of how rhetoric of sustainability and livability provides an aesthetic screen and common-good political justification for existing processes of urban land and property value speculation, dispossession, and, for urban governments and growth machines, property-value led development strategies. For more on property valued-led development strategies in the 1990s-2000s and the role of finance in promoting them, see Harvey (2001); Logan and Molotch (2002); Hackworth, Jason R. (2007) *The Neoliberal City: Governance, Ideology, and Development in American Urbanism*, Ithaca, NY: Cornell University Press; Torrance, Morag (2008) “Forging Glocal Governance? Urban infrastructures as networked financial products” *International Journal of Urban and Regional Research* 32.1: 1-21; Weber, Rachel (2010) “Selling City Futures: The financialization of urban redevelopment policy,” *Economic Geography* 86.3: 251-274, Ashton, Philip, Doussard, Marc and Webber, Rachel (2012) “The Financial Engineering of Infrastructure Privatization,” *Journal of the American Planning Association*, 78.3: 300-31. Fulton (1999) provides many concrete examples of the longer-term development of these policies in California. I argue here that new green value is being fed directly into this kind of scheme post-2008 collapse, rather than merely concealing it. Current policy briefs make this connection explicit. See, for example, The World Bank (2010) *A City-Wide Approach to Carbon Finance*, Washington, DC: Carbon Finance Unit, World Bank; Clapp, Christa, Leseur, Alexia, Sartor, Oliver, Briner, Gregory, Corfee-Morlot, Jan (OECD) (2011) “Cities and Carbon Market Finance: Taking stock of cities’ experience with Clean Development Mechanism (CDM) and Joint Implementation (JI),” *OECD Environment Working Papers*, No. 29, OECD Publishing; Della Croce, R., Kaminker, C. and Stewart, F. (2011), “The Role of Pension Funds in Financing Green Growth Initiatives”, *OECD Working Papers on Finance, Insurance and Private Pensions*, No. 10, OECD Publishing; Mercer (2011) *Climate Change Scenarios: Implications for Strategic Asset Allocation*; Corfee-Morlot, J., et al. (2012), “Towards a Green Investment Policy Framework: The Case of Low-Carbon, Climate-Resilient Infrastructure,” *OECD Environment Working Papers*, No. 48, OECD Publishing; and Merk, O.,

Saussier, S., Staropoli, C., Slack, E., and Kim, J-H (2012) "Financing Green Urban Infrastructure," *OECD Regional Development Working Papers*, OECD Publishing.

¹³⁵ See "Promoting Energy Efficiency & Renewable Energy" in Office of the Assessor-Recorder (2011), p. 36.

¹³⁶ The local jobs created and innovation supported, in theory, by projects like these. These jobs and tax returns are a reason cities support this specific type of real estate *as* economic development, over and above more established property value-led growth strategies. For example, the development of advanced green and energy-efficient building materials has been an important cleantech growth area in the Bay Area. Professional and financial services related to green and energy-efficient homebuilding are also clustering in San Francisco, including green architecture and design, energy auditing, and the development of specialized financial products to facilitate commercial and homeowner investment in energy efficiency retrofits and on-building renewable energy installations. For an important statement of this strategy, see SPUR (2008) Growing Green: How San Francisco can become a leader in the cleantech boom, *The Urbanist*, September 2008. SPUR's ongoing involvement in this kind of project represents part of the ongoing evolution of its original role related to the federal Urban Renewal program. For other statements of the economic development potential of the green economy in the Bay Area and on commercial buildings more specifically, see Chapple, Karen and Hutson, Malo (2010) *Innovating the Green Economy in California Regions*, Center for Community Innovation, UC Berkeley and Next10 (2010) *Untapped Potential of Commercial Buildings: Energy Use and Emissions*. Next10 (2010) explicitly frames energy wasted in commercial buildings as a "stealth drain" on the state's economy, an important statement how energy efficiency is framed as a resource.

¹³⁷ San Francisco Department of the Environment (2014c) "GreenFinanceSF: Commercial PACE program," accessed 11 March 2014 at

<http://www.sfenvironment.org/article/financing/greenfinancesf-commercial-pace-program>

¹³⁸ Weyerhaeuser (2014a) "Weyerhaeuser Real Estate Company (WRECO): The biggest homebuilder you've never heard of," accessed 11 March 2014 at <http://www.weyerhaeuser.com/Businesses/Wreco>. For Weyerhaeuser as a REIT, see Weyerhaeuser (2009) "Weyerhaeuser Announces Intent to Elect REIT Status; Timing Under Consideration," Weyerhaeuser News Release 15 December 2009, http://www.weyerhaeuser.com/Company/Media/NewsReleases/NewsRelease?dcrID=09-12-15_WeyerhaeuserAnnouncesIntenttoElectREIT. Weyerhaeuser also sells itself as a leading green builder in the residential sector: "Weyerhaeuser Real Estate Company's five homebuilding subsidiaries are at the forefront of building energy-efficient homes, reducing water use and introducing other green features that consumers now expect in newly built homes." Weyerhaeuser (2014a) "Green Homebuilding," accessed 11 March 2014 at

<http://www.weyerhaeuser.com/Sustainability/Planet/GreenBuilding/GreenHomebuildingActivities>. See also, for example, Potlatch Corporation (2014), "About Us," accessed 11 March 2014 at <http://www.potlatchcorp.com/AboutUs.aspx>. "Today, as a Real Estate Investment Trust, or REIT, we own approximately 1.42 million acres of forestland in Arkansas, Idaho, and Minnesota... Through its taxable REIT subsidiary, the company also operates six manufacturing facilities that produce lumber and panel products. The company... also conducts a real estate sales and development business through its taxable REIT subsidiary."

¹³⁹ See, for example, OECD (2010), "Private Financial Sector Investment in Farmland and Agricultural Infrastructure," OECD Food, Agriculture and Fisheries Papers, No. 33, OECD Publishing, HighQuest Partners, United States; Anseeuw, Ward; Wily, Liz Alden; Cotula, Lorenzo and Taylor, Michael (2011) Land Rights and the Rush for Land: Findings of the Global Commercial Pressures on Land Research Project, International Land Coalition; Cotula, Lorenzo (2012) "The International Political Economy of the Global Land Rush: A critical appraisal of trends, scale, geography and drivers," *The Journal of Peasant Studies* 39.3-4: 649-680; Fairhead,

et al. (2012); McMichael, Philip (2012) “The Land Grab and Corporate Food Regime Restructuring” *The Journal of Peasant Studies* 39.3-4: 681-701.

Chapter 2

¹ McKinsey and Co. (2009) *Unlocking Energy Efficiency in the U.S. Economy*

² The report restricted this particular analysis to non-transportation forms of energy; that is, energy use associated more or less closely with buildings and the activities that these interior spaces house.

³ They chose 675 separate measures in the end.

⁴ The choice of a discount rate is attached to expectations about rates of return coming from other kinds of potential investments.

⁵ For example, treating energy saved as a commodity requires establishing a baseline level of energy consumption pre-intervention and then attributing all energy saved from that point onward to the new measures or practices put in place, essential to providing the payback to utilities or private companies performing these energy services but potentially difficult to achieve in practice.

⁶ As reflected in environmentalist economists’ neoclassical framework of “externalities” and their internalization, and beyond it into more fundamental questions about value in the economy. As Gomez-Baggethun et al. (2010) discuss, neoclassical economics largely abandoned these questions, and it has remained for ecological economics and other heterodox traditions to reengage them. Marxian political economists have also entered these debates.

⁷ According to the Online Etymological Dictionary, this meaning of “a country’s wealth” was first recorded in 1779.

http://www.etymonline.com/index.php?term=resource&allowed_in_frame=0

⁸ Merriam Webster online. <http://www.merriam-webster.com/dictionary/resource> 2014 Merriam-Webster, Incorporated

⁹ See, for example, Livingstone, David (1993) *The Geographical Tradition*. Hoboken, NJ: Wiley-Blackwell. Many critical scholars have commented on this history.

¹⁰ This is a highly general summary of a famously complex and multivalent field. Another key origin point was these accounts’ fight against neo-Malthusian reads of environmental degradation and food security that rose in the 1970s, notably exemplified by Ehrlich’s *The Population Bomb* and the Club of Rome. Political ecology also organized to question mainstream construction of ideas of desertification in the Sahel region of Africa and explanations for rainforest deforestation.

¹¹ They broadly redefine these systems in terms of social use value, i.e., as “ecosystem services.”

¹² And see e.g., Cronon (1983) for a longer history.

¹³ Scott (1999) demonstrates how state resource management programs can similarly lead to radical simplification that is ultimately destructive of ecosystem reproduction.

¹⁴ Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD).

¹⁵ Political economic critics have leveled similar criticisms of finance in the current moment, reigniting a debate fought more or less intensely since the rise of industrialization. Political ecologists now examine finance more closely in land grabs as well.

¹⁶ Including less tangible “resources” like conservation projects connected to tourism revenue.

¹⁷ For example, sulfur hexafluoride, a highly potent man-made greenhouse gas typically used in refrigerants.

¹⁸ Which can be thought of as part of a broader neoliberal campaign to create new environmental markets and resources.

¹⁹ Or green technology; I will generally use the latter term in this research.

²⁰ McCarthy (2012) suggests that the contemporary fields already overlap to a considerable extent.

²¹ Assessed using Google Scholar’s tool for tracking citation counts and sources.

²² New businesses targeting energy efficiency as a resource often do require actual net energy savings, although in a more targeted and atomistic way. Of course, they may open themselves up to rebound effects ala the class Jevons paradox.

²³ McKinsey and Company (2014), website, <http://www.mckinsey.com>, accessed 10 April 2014

²⁴ McKinsey and Company (2014) “Insights and Publications: Resource Revolution,” http://www.mckinsey.com/insights/sustainability/resource_revolution, accessed 10 April 2014

²⁵ http://www.mckinsey.com/about_us/history

²⁶ And important for a greening perspective given that this is the period in which the Bloomberg mayoral administration introduced the NYC2030 plan for New York, which aimed to green the city.

²⁷ Dobbs, Richard; Remes, Jaana; and Woetzel, and Jonathan R. (2012) “Strengthening the foundations of emerging cities,” <http://mckinseysociety.com/strengthening-the-foundations-of-emerging-cities/>.

²⁸ As I discuss in more depth later. This competition has been framed in the US by neoliberal withdrawal of federal intragovernmental support. This federal redistribution was laid down in the New Deal Era and continued through the US’s long boom of the mid-twentieth century. Its withdrawal has heightened inter-urban boosterism (never gone in the US even in the mid twentieth century), creating conditions more like the US urban scene in the nineteenth and early twentieth centuries. The global context includes the progressive rollback of international capital controls, other moves to deregulate finance, and the financial industry’s own technological and organizational revolutions over the last forty years.

²⁹ McKinsey (2014) “About Us: History,” accessed 2 April 2014 at http://www.mckinsey.com/about_us/history. Scholars including Block (1977), Chandler (1977), and Domosh (2007) have tracked the nineteenth and early twentieth century multinationalization and foreign direct investment strategies of rising Third Industrial Revolution industries, manufacturers like General Electric and International Harvester who looked early to international markets and international production. Block (1977) and Ferguson (1984, 1989) discuss how this rising group of massive companies looked to trade liberalization to expand their markets. In these ways and in other questions like labor relations, these rising, capital-intensive industries developed largely divergent geopolitical interests from Gilded Age industries, often more labor-intensive ones, represented in the protectionism of the old System of ’96 and Republican Party. In the New Deal-Keynesian order, they formed the multinational bloc that, confident of its technological edge coming out of World War II, welcomed free trade policies, and simultaneously welcomed or tolerated capital controls and the global regulation of finance (Block, 1977).

³⁰ McKinsey (2014) “About Us: History”

³¹ Peck and Tickell (2002)

³² Many scholars now employ the term financialization, but they refer to slightly different things when they do so (Lee et al., 2009).

³³ They also expanded the complexity of the boutique financial vehicles (swaps, options, and other financial derivatives) that they were able to offer large-capital clients.

³⁴ Emerging work on financialization also examines how the sector might stand to profit from climate change adaptation, suggesting that a new “risk industry” is emerging. These financiers, insurers, and consulting experts propose to profit from growing environmental-economic volatility itself – selling ostensible security in a more chronically insecure world via exotic insurance products (Johnson, 2011), and potentially competing with states’ own evolving security programs (e.g., McMichael, 2012).

³⁵ The FAO (2010) rehearses arguments that draw direct parallels between the logic of microfinance and investment in developing country farmland as traditionally high-risk fields. (Combining these strategies, microinsurance products and weather derivatives increasingly

marketed to farmers around the threat of climate change make up yet another emerging investment frontier). In one critical yield gap argument for land grabs, agro-industrial revolutions are framed as permitting higher crop yields, argued to be necessary to avert a Malthusian food security crisis (McMichael, 2012). In these arguments, land is framed as undervalued given the changing state of social necessity and technological opportunity (e.g., Hawkins, 2010).

³⁶ In addition, for its client Enron (a company deeply embedded with McKinsey personnel; e.g., Doward, 2002), McKinsey promoted off-the-books accounting practices and debt securitization processes that would later inflate the subprime bubble of the 2000s – and that continue to circulate in new forms in the wake of its collapse.

Chapter 3

¹ The relevant scale of analysis in this story shifts from US utility service areas (and their production) to the changing geographies of energy service provision nationally. In that origin story, the state of California comes up as a particularly important generative site for novel utility energy efficiency programs, communities of research and technology development, and for the driving push for deregulation: these processes have been co-constitutive in key ways. I will focus on the US context, although processes including deregulation have had an international footprint in the internationalization of US utilities and utility privatizations since the 1990s. Federal government programs in theory encompass the US built environment of rural places, small towns, and medium-size cities as well as the major metropolises that dominate current discussions on cities and climate change. These initiatives have attempted to organize common national requirements on energy efficiency, subject to federalism’s division of powers, and have redistributed national surplus in the form of target subsidies for programs like weatherization. During the Great Recession, the American Recovery and Reinvestment Act (ARRA) gave this kind of national energy program new life, as the stimulus package aimed to broadly distribute funds for energy efficiency. Actually existing geographies of energy efficiency have been more selective. States like California have led the way in establishing progressive building energy codes, while other states have long gone without. As the private business of energy efficiency has grown, it has developed an uneven geography. The first wave of Energy Services Companies (ESCOs), which boomed in the 1990s, focused heavily on the institutional sector, which meant a geographic concentration in cities, government centers, and college towns. Energy efficiency’s broader commercialization today may have only strengthened its urbanization, as today’s ESCOs and mass-market retrofit businesses target major urban markets and built environment conurbations, and financial ventures look for “creditworthy” cities and populations in a time of economic turmoil.

² Joined by other standards bodies. For example, since its founding in the 1990s, the International Code Council (ICC).

³ For more on Technocracy, see Nye (1992).

⁴ For overviews, see Walker (2007).

⁵ Schrag (2004 [1998])

⁶ Lovins (1976).

⁷ See, for example, Olgyay (1963), Brand (1995), Turner (2006), and Pike Research (2013).

⁸ See Walker and Large (1974) for an early critique.

⁹ See discussion in Shi (2001)

¹⁰ Battles (2008)

¹¹ DOE (2014)

¹² Deason and Hobbs (2011)

¹³ Often operating beside the Department of Health and Human Services’ Low Income Home Energy Assistance Program (LIHEAP) in common energy assistance offices. Weatherization

programs fund building improvements, while LIHEAP pays a portion of home energy bills for low income households, especially those paying a large portion of household income for energy.

¹⁴ Which have grown increasingly stingy as energy prices dropped and the memory of the crisis receded. See Sissine (2012, p. 6): “Funding Trend. Except for the FY2009 Recovery Act appropriation, program funding has been on a long-term downtrend since FY1979 (constant FY2010 dollars)... In 8 out of 34 years (from FY1978 through FY2011), the administration requested zero funding (program termination): FY1982, FY1983, FY1984, FY1987-FY1990, and FY2009.”

¹⁵ Justified according to incomes a certain percentage below the federal poverty level – e.g., see Smith and Richardson (1989). Berry et al. (1997, p. 18) map the uneven geography of utility weatherization allocation per household as of 1992. They show relatively high allocations in states like California, Wisconsin, and Connecticut, and a completely lack of expenditures in many states in the US South.

¹⁶ Weatherization programs indirectly favored homeowners over renters.

¹⁷ And part of a suite of agitation and programs particularly trying to speak to homeowners feeling threatened by the 1970s changes – the energy crisis, but also stagflation and broader conflicts over Great Society programs. Particularly in places like California where property booms caused skyrocketing property taxes, these tensions reached a head in the homeowners revolt of the late 1970s.

¹⁸ Weatherization programs developed alongside renovate-in-place ideas, proposals for dealing with “blight” that argued for alternatives to the large-scale displacements and dispossessions of midcentury urban renewal. Blight designations were typically framed in appraisals of lack of building maintenance and disrepair, although Weber (2002), Self (2003), Sugrue (2005 [1996]), and others unpack the racialized overtones, growth machine imperatives, and other relatively arbitrary and politically malleable possibilities that these designations often concealed.

¹⁹ Part of demands for increased quantitative results and accountability from weatherization interventions that came with heightening neoliberal attacks on both federal social welfare programs and energy conservation efforts, and with the associated rise of broader cost-benefit scrutiny of federal government expenditures.

²⁰ These kinds of breakdowns also turn up findings of major significance for longer-term efforts to reform US energy use. Certainly, they suggest hotspots that future programs might target. However, they can also reveal energy consumption patterns not easily addressed by building retrofits. For example, analyses of the way households and homes as spaces consume energy point to the profound energy significance of increasing US home size, an important trend during the 2000s exurban building boom. Analyses like EERE (2008) identify this growth as a dominant factor in increasing residential energy use – and unfortunately, not one easily addressed by even the most comprehensive retrofits. A more radical and longer-term perspective must emphasize the historical novelty of maintaining these fully HVAC’d spaces that are nominally independent of external environments, as well as the natural processes of material deterioration and social processes of disinvestment that make buildings break down and lose these seals over time. Commercial and institutional spaces have different energy use profiles, and vary considerably by type within these broad categories. For example, lighting can be much more significant in commercial retail spaces, and specific activities like cooking or the operation of medical equipment can be large energy consumers.

²¹ According to Berry et al. (1997) another cause of the decline in funds from the 1980s was the exhaustion of weatherization funding from the Petroleum Violation Escrow (PVE) Fund, money derived from legal penalties levied against oil companies that had been convicted of violating price controls.

²² Hirsh also describes how this growth strategy worked for other players associated with the power industry: “Consulting engineers and construction firms also maintained full work

schedules as utilities built ever-larger generating stations. Financiers endorsed the strategy, too, because the continuous construction created a demand for capital, which they happily provided... investors appeared happy with the strategy as well, because growing electricity sales translated into healthy incomes for the power companies; the improved financial strength of the companies allowed them to pay increasing dividends to shareholders” (Hirsh, 1999, p. 49).

²³ Thermodynamic principle limits steam generation systems to about 48% conversion efficiency at best, and in practice the maximum was considerably lower – Hirsh cites 40% (Hirsh, 1999, p. 56).

²⁴ According to Hirsh (1999, p. 60) electric utilities had increased their use of petroleum as a generation fuel in the 1960s and early 1970s; oil made up 14.2 percent of the overall generation mix in 1970 (up from percent in 1962).

²⁵ An opening of the sector also extended by the Energy Policy Act of 1992. As discussed, this latter legislation perhaps most influentially spurred the mid to late 1990s rollout of neoliberal natural gas and electricity deregulation schemes in California and other states. However, certain of its provisions also supported renewable generation experimentation.

²⁶ Hirsh (1999, p. 156) discusses the Residential Conservation Service, established in 1978 by Carter’s National Energy Conservation Policy Act, as a prologue to more stringent DSM policies established in the 1980s. The Service coordinated home energy audits performed by utility companies. However, Hirsh argues that its lack of stringency meant that utilities were not compelled to put much effort into their efficiency and conservation strategies; he finds that forty states had audit programs in 1983 but with little uptake from eligible customers.

²⁷ And nominally to undertake other load management activities, although this meaning was quickly deemphasized.

²⁸ Hirsh (1999, p. 194) emphasizes the technological underpinnings of Lovins’ vision: “according to Lovins, a technological revolution in energy efficiency had begun in the 1970s, and it had accelerated in the 1980s, making possible twice the energy savings at one-third the cost of those identified five years earlier. This abundance of conservation technologies allowed customers to save huge amounts of power that could be considered the equivalent of power plants.” He also used terms like “negative load” deployment and advocated these strategies as providing the cheapest resource for utility systems.

²⁹ Typically they did not work on small structures like homes. The average cost for their large-scale, specialized interventions was ~\$350,000 and they have been long dominated by the MUSH sector (public buildings and institutional space), something like 55-65 percent or more over the years of their operation.

³⁰ Rahim, Saqib (2009) “Energy Savers Try to Rebuild Their 'Brands' With Government Contracts,” *New York Times* 20 August 2009

³¹ Vine et al. (1999). This article’s section on “future services” is illuminating in today’s market of big data energy efficiency services and other software approaches. For example it refers to information technologies that in this previous iteration of high tech meant telephone and cable television opportunities for real-time energy analysis and automation.

³² E.g., Vine et al. (1999)

³³ Given the dominance of fossil fuels in the US’s electricity and general energy supply, energy savings in the built environment translate also into reduced GHG emissions and other environmental costs associated with fossil fuel production. For example, on average for the US in 2005, residential buildings’ primary energy use³³ was about 72% electricity, 20% natural gas, about 2% oil (generally in the form of home heating fuel in rural areas) (EERE, 2008). And in 2005, despite utilities growing use of natural gas in electricity generation, the overall national electricity mix remained dominated by coal (in addition the growth of renewables today, the unconventional natural gas boom is further expanding the share of lower carbon-density fuels in the national electricity generation mix).

³⁴ I.e., that even for environmental advocates who endorse sustainable consumption as an environmental change paradigm, that behavior patterns like building energy use are much harder to alter at will than less structural (on the consumer side; not on the producer side) changes like purchasing organic versus conventional produce/food goods.

³⁵ A continuity with the market environmentalist GHG emission offset schemes that political ecologists and other critical development activists and environmentalists have critiqued.

³⁶ In addition to government support, provoked by new federal directives, supports, and funding associated with the stimulus, many utilities nationwide dramatically expanded their energy efficiency and conservation efforts in the late 2000s, ramping up their contribution to both low-income weatherization programs and supports for other customers seeking to lower their energy use through building retrofits.

³⁷ Solar panel installation was another important target for green collar jobs advocacy.

³⁸ I.e., with nominal value on mortgage payments higher than appraised home value in new bottomed-out markets. These arguments confront a broader context that includes ongoing foreclosures, as well as investor buy-ups of properties to convert owned homes into rental properties.

³⁹ Of course, not always to the long-term benefit of disinvested places and communities, as previous gentrification experience has shown.

⁴⁰ In other words, “efficient” output per public dollar spent.

⁴¹ A *New York Times* op-ed by the president of the National Trust for Historic Preservation.

⁴² It changed the Sunbelt’s expected allocation of the funding from 16% to 31% overall.

⁴³ This built environment – more accurately, economic and social reproduction accomplished via this built environment – was responsible for about 40% of total US GHG emissions in 2005; 9% of total world carbon dioxide (CO₂) emissions (more than every country other than the US and China) (EERE, 2008). And the existing rate of replacement for this landscape was slow.

⁴⁴ This number drawn from Preservation Green Lab (2012), p. 30.

⁴⁵ These claims could use more analysis, given problems associated with the boom-bust nature of the urbanization process in the US/general capitalist context; smoothed averages present a poor picture of these building cycles.

⁴⁶ Although the report still maintains the importance of retrofitting: “In developed countries, the majority of buildings which will be standing in 2050 have already been built, so policies should encourage building owners to retrofit their buildings in such a way as to optimize emission reductions. In developing countries, particularly those undergoing rapid urbanization, policies should encourage property developers and construction companies to incorporate energy and greenhouse gas emission considerations into the feasibility and design stages of buildings” (UNEP SBCI, 2009, p. 6).

⁴⁷ Local governments and public-private entrepreneurs have been key players here, acting as intermediaries between commercial or residential building owners and third party financing companies in models like residential and commercial property-assessed clean energy (PACE) programs.

⁴⁸ A troublesome thought, as it contains important information about what households consider bare minimum social reproduction expenditures. Relying on utilities to collect financial company fees as well as energy payments quickly becomes in this context a shady proposition.

⁴⁹ Much of this analysis was drawn from my attendance at ACEEE’s 2012 Energy Efficiency Finance Forum, which specifically targeted the challenge of bringing energy efficiency retrofits to scale in the US via private financial tools and partnerships.

⁵⁰ This point on the Brookings analysis is taken from Preservation Green Lab (2012).

Chapter 4

¹ For a dystopian commentary on these midcentury imaginaries, Ray Bradbury's "The Veldt," written in 1950.

² Once again producing the invocation of personal responsibility that has become an endemic part of life under neoliberalism.

³ Depending on the framing, these models can resemble the sort of bids for perfect information and rational choice promoted by more economic models of human behavior. These models have been critiqued by social science disciplines, and even more business-minded analyses of real-world consumer behavior. Although I do not rehearse these debates at length here, working through the logics of these models more thoroughly is a critical area for analysis.

⁴ It is clear that green and energy efficient building and rebuilding programs are attempting to blur boundaries between first and second nature, considering the ways that social and economic reproduction in and through these structures, and building processes themselves, are perturbing environmental fluxes and destabilizing the ongoing reproduction of ecosystems and human societies/places. As we will see, admitting the environmental significance of taken-for-granted energy use (and water, and other material fluxes, especially via broader green building strategies) via climate change considerations and other axes of environmental significance opens up a Pandora's box of ways that human second natures continue to be embedded in broader environmental processes, perceived and unseen. It is precisely this quality/perturbation that the aforementioned energy efficiency as a resource and green building programs attempt to reframe. And the fact that this human environment/second nature and its processes are far more complex than simplified view-from-30,000-foot state or financial framings present is particularly problematic when these actors try to convert greening projects into market values.

⁵ Critically, these existing architectural preservation groups and brownfield developers are now mobilizing in the field of energy retrofitting and energy and environment-related redevelopment.

⁶ Note Brand's acknowledgements section – the work is within this tradition even if those who have been influenced by it in more conventional green architecture etc. don't recognize that fact.

⁷ These are the same kinds of manifestations of built environment embeddedness in environmental fluxes that real estate appraisers and property tax assessors encode formulaically in estimates of building value depreciation and "natural" physical lifespan (or that structural engineers consider when giving US national infrastructure ratings). Later work will discuss the complexities of this quantitative value/trend assignment in more detail, particularly considering the factors that can make material and economic depreciation trends diverse. Following Weber (2002) and other scholars, it will consider how economic depreciation accelerations can manufacture obsolescence in building and built environments that has little to do with its structural soundness. These questions are becoming intimately bound up in energy and environmental redevelopment visions. Ironically so, as speedup in the production of economic obsolescence; what geographic creative destruction looks like on the scale of buildings and pieces of infrastructure and their formal economic life; threatens the fundamental propositions of this turn toward energy and climate-justified durability and the conservation of existing material landscapes.

⁸ Especially around the idea of "split incentives," which particularly gets at the problem of landlords' lack of incentive to make energy efficiency retrofits and other structural modifications when renters themselves are charged with paying utility bills. Renters themselves may make behavioral modifications up to a point but face constraints at the margin between use changes and behavioral changes that include decisions to undertake more substantial retrofits.

⁹ For example, in analyzing Solyndra's failure we should look to both company-specific factors and broader structural forces– the unconventional fossil fuels boom driving down energy prices, solar sector gluts, free trade structures, etc.

¹⁰ According to Block (2008), “ARPA initiatives have been copied from the early 1990s onward in the Department of Energy, that has carried out hundreds of programs in collaboration with industry that focus on overcoming specific technological barriers. One particularly ambitious and successful program involved partnering with General Electric and Westinghouse in the 1990s to develop a new generation of gas turbines to produce electricity with significant increases in efficiency and comparable decreases in pollution...DOE covered half the cost of this project and created at Georgia Tech University a new academic specialty focusing on the issues of constructing high temperature turbines. This model is being used today to create collaborations between universities and industries to discover cost-effective techniques for turning agriculture waste products and fast growing weeds into ethanol” (p. 188). See also Hirsh (1999, pp. 198-9) on the Department of Energy’s influential programmatic support for utility energy efficiency programs under the label of “integrated resource planning” (IRP) in the early to mid 1980s.

¹¹ Following Otis Graham, Block argues that the rhetoric of “picking winners” actually emerged in an influential form earlier, within the Democratic Party primaries in 1984. Walter Mondale, the Democratic nominee, used it as a repudiation of industrial policy; a critical turning point in the turn toward reliance on markets, he suggests, since the question of appropriate industrial policy had still been widely in discussion during Reagan’s first term (Block, 2008). And he provides some broader context: “It was anxieties about the ability of U.S. firms to compete successfully in the global economy that had forced industrial policy ideas onto the political agenda in the first place. The U.S. trade deficit in goods worsened significantly in the second half of 1970s, improved slightly during the years of belt tightening and recession from 1979 to 1982, and then dramatically worsened as the Reagan economic boom unfolded. Japan at this time appeared to be a highly effective juggernaut that had successfully captured much of the U.S. market for automobiles and electronic goods and was threatening U.S. leadership in computer chips, computers, and other emergent technologies. Old-line U.S. industrial firms, exemplified by the auto companies and big steel, were seen as rusty dinosaurs, thick with bureaucracy, pretty much incapable of adapting to a new environment” (Block, 2008, p. 179).

¹² Comparable to an older specialization of function away from agriculture – although of course this ignores the continuing importance of agriculture and the food system in the US’s economic base and exports, and ongoing protectionist policies for agriculture. For the proliferation of Schumpeterian framings in high tech, see for example The popularization of the term “disruptive innovation” with tech literature.

¹³ Amid other federal supports. Cardwell (2012): “the Defense Department has been aggressively pursuing [clean energy] alternatives, both for its bases and for forces in the field. Late last year, for instance, SolarCity, a company based in San Mateo, Calif., announced that Bank of America Merrill Lynch was lending it up to \$350 million to install enough panels to power 120,000 military homes.”

¹⁴ Even bullish commentators expect the securities to initially command a high interest rate as a reflection of the considerable uncertainties and risks involved (Woody, 2011a, 2011b). Advocates project cost of capital benefits over the longer-term: “You’ll see an increasing cost of capital between those companies like SunRun that are able to access these [securities] markets and other companies that don’t have the scale to do that,” says Fenster [chief executive of SunRun]. “It benefits consumers because we’re able to raise capital at a lower cost and offer power at a lower cost” (Woody, 2011a).

Chapter 5

¹ McGraw-Hill Construction (2012) projected that new green construction and renovation would make up 55% of the overall US commercial and institutional market in 2016; 38% of the residential market. It estimated the 2012 value of the total market (residential and non-residential) at \$85 billion; it projected that total value of new green building would rise to between \$98

billion and \$106 billion in 2013. “Green building remains a bright spot in a still uncertain economy. Green is expected to represent 44 percent of all commercial and institutional construction in 2012, growing up to 55 percent by 2016. Residential green construction is also on the rise. It is expected that by the end of 2012, green homes will comprise 20 percent of the market, and in 2013 a 22-25 percent share by value is expected, equating to a \$34-\$38 billion opportunity. By 2016, this share by value is expected to increase to 29-38 percent - an estimated \$89-\$116 billion- based on the current single-family residential construction forecast” (McGraw-Hill Construction, 2012b).

² According to McGraw-Hill Construction (2013), between 2012 and 2015 “63% of firms have new green commercial projects planned, 45% have plans for new green institutional projects, and 50% have plans for green renovation work” (p. 6). Firms in different countries have differing focal areas within this field. For example, “In the UK and Singapore, green retrofit and renovation projects are planned by the greatest number of firms, at 65% and 69%, respectively” (p. 6).

³ Acquired in 2002; in 2012-2013 facing uncertainty as Deutsche Bank has considered selling it off and subjected it to restructuring.

⁴ Some of this decision stems from political disagreements with standards like LEED and related unwillingness to pay an extra fee for the US Green Building Council’s stamp of approval.

⁵ Although the theoretical question demands more analysis, this long-term management and lessened disposability of buildings might deliver agricultural fertility-like rents that would operate over and above (or potentially confound) the kind of location-determined rents that have traditionally dominated urban real estate markets.

⁶ The kind of speculative possibility is encoded into logics of e.g., US real estate appraisal, where besides use of hedonic appraisal practices for some properties and types of property, “comparison” appraisal – survey of recently sold “comparable” properties within some defined geographic distance of the property in question. This moving baseline of comparables facilitates collective value inflation – and sometimes rapid deflation.

⁷ There is a broader story to tell here about the sociology of real estate markets and how investors jump into new things – e.g., via new investment “storylines.”

⁸ In the wake of the subprime collapse and subsequent financial sector turmoil and restructuring, the most analyzed manifestations of financialization in real estate development have been within the actual structures of mortgage lending and financial instrument development themselves. Analysts like Brenner (2009), Wyly et al. (2009), and Bardhan and Walker (2011) have tracked the specific predatory lending practices that fueled subprime lending – “reverse redlining” – on the ground, the subsequent pooling, tranching, and on-selling of these bundled mortgages as hybrid products in secondary markets, and the structures of credit rating and insurance that greased the wheels of this financial mortgage production and dissemination machine. They have tracked its longer roots in the neoliberal era consolidation and centralization of financial institutions, and the crisis-fueled disappearance of older mortgage lending institutions like regional savings and loans (decimated in the late 1980s Savings and Loan Crisis). And many economic and urban geographers and other critical scholars have tracked real estate speculation as a critical field for the play of hot capital in the rollout of neoliberalism. Although not the only sector that has supported the construction of increasingly byzantine financial products and the blowing up speculative bubbles urban real estate has been a favored one for finance. Besides the savings and loans bubble, other critical neoliberal real estate-financial bubbles included late 1980s commercial real estate in global cities, real estate speculation in build-up to the late 1990s the East Asian financial crisis, current European crises in Spain, etc.

Some commentators on the current moment have looked even farther back, pointing to longer established US federal supports and subsidies for homeownership; like energy modernization, many of them products of Progressive Era-New Deal revolutionization of real

estate and US homeownership. These include tax subsidies for homeownership, Fannie Mae and Freddie Mac's creation of secondary mortgage markets, and other institutions – massive ongoing federal subsidies that like military Keynesian expenditures were largely exempted from neoliberal era excoriation. (And we should remember that subprime loans were originally sold as part of an epochal revolution in financial technologies meant to further older New Deal era revolutions in risk management products/practices like derivatives and tranching; Shiller, 2003 and others claimed that this “democratization of finance” could take existing products a step further and provide access to borrowers formally barred from finance as too high-risk, non-“creditworthy” – endemically a highly racialized exclusion in the US.)

⁹ With a number of REITs greening their commercial real estate portfolios, long-proposed green building REITs may be on the horizon (e.g., Biers, 2010), along with other cleantech and renewable energy proposals.

¹⁰ Prospective use of REITs for farmland suggests that land here is coming close to being employed as a pure financial asset, another of Harvey's assertions about the essential nature of land in capitalism that has provoked considerable debate. I argue that it took considerable labor to produce this result, considering the kind of dichotomy financial actors more typically maintain between real and financial assets in their own discussions. (Haila, 1988 makes a similar point about commercial real estate in central business districts and Christophers, 2011 reviews some of these debates).

¹¹ Popovec, Jennifer Duell (2012) “NAREIT Evaluates New Sustainability Ranking Platform,” *National Real Estate Investor* 16 May 2012; Piperato (2013)

¹² Piperato, Susan (2013); Hirsch, Matthew (2013) “Coming soon: Sustainability ratings for real estate investments” *GreenBiz.com* 7 March 2013

¹³ See, for example, the HIP portfolio: <http://hipinvestor.com/for-investors/hip-portfolio/hip-sustainable-real-estate-portfolio/>. See also Sarasin Sustainable Real Estate Equity - Global (EUR): <http://www.bloomberg.com/quote/SARRESB:LX>: “an open-end fund incorporated in Luxembourg. The Fund's objective is long-term capital appreciation. The Fund invests worldwide in shares and equity securities of companies whose activities are concentrated in the real estate sector and which includes ecological and social sustainability as part of business operations.”

¹⁴ Another, also problematic, way in which we see the kind of effective demand problems mentioned above showing up in actors' calculations is in the way that they are proposing on-bill financing schemes as way of getting around the aforementioned real estate market problems. However, this strategy must raise critical questions. Although it frames energy efficiency retrofit financing in a distinct sector, the resources that will be required to effect these changes will ultimately come at base from the same places, centrally household wealth. As discussed, previous histories of longer growing economic insecurity for many and financialized accumulation by dispossession (in the subprime and previously, via avenues like growing US credit card debt) have compromised these populations' creditworthiness. Those problems are real, and not immediately solvable by this kind of strategy. Indeed, we should be cautious of it as a potential new avenue for accumulation by dispossession. Promoters frame on-bill financing as attractive because they point to the steadiness of utility bill payments. The undiscussed reason behind that is of course that these energy costs are a basic cost of social and economic reproduction that even households and businesses in extremity must pay. Is this an attempt to dig even deeper into these basic necessities in industrial state standards of living and turn them to financial sector profit?

Chapter 6

¹ Although I do not directly consider very large corporate actors like Google in this research, future research should.

² And, of course, in the best case merely deferring overaccumulation crises.

³ A well-known state structuring of the workings of US real estate is the federal government's role in shaping the racialized redlining practices of post-World War II home mortgage lending. Freund (2010) explicates how, beyond racist connotations of race and property blight, real estate economists argued in highly neutralized terms that this kind of exclusion was necessary to support mass working class homeownership and multi-decadal debt given ongoing racial discrimination in wages and employment security. Of course, these structures perpetuated racialized exclusion from homeownership while legally according other economic benefits to residential and commercial property owners – and indirectly to the real estate development and mortgage lending industries. This structuring included the homeownership tax deduction benefit and other financial structures that framed home equity as the most important source of working and middle class wealth – financially visible as collateral for other important sources of indebtedness like paying for college educations (and, of course, making the racialized-class exclusion from property ownership that persists today a critical ongoing exacerbation of economic insecurity).

In addition, the kind of transformations of property as a sector proposed with green building have precedents both in evolutions of the physical construction of built environments and in the legal-regulatory structuring of these changes. In an important example, actors shaping US taxation policy and the economic and financial visibility of buildings have altered the value depreciation trajectories of both commercial and residential property at significant historical junctures. Real estate developers and financial speculators have used this kind of governmental rule-making change as the locus for major speculative real estate bubbles. Sakolski (1933) describes a long history of this kind of gaming of state rules. A more recent US example was the late 1980s commercial real estate bubble (see Downs, 1985; Sbragia, 1996; Fainstein, 2001). When the national tax law changes allowed for more rapid commercial depreciations, speculators in downtown skyscrapers used this clause to invest in real estate – the provisions of the altered tax structure meant that they could use value losses from these overbuilt real estate projects to significantly reduce their overall tax burden, at minimal overall cost to them. Of course, these more specific intentional and inadvertent uses of governmental regulatory structures overlay more basic state subsidies to real estate financiers. In the US, these critically include the federal government's tax classification of profits from land development as capital gains rather than profits to a business. This classification has allowed typically deep-pocketed land developers to benefit from tax rates that the national government has gradually lowered since during the neoliberal era.

The federal government's role in shaping secondary real estate markets has also been critical, as have the specific ways in which the state has used this power to influence financial underwriting practices nationwide. Fannie Mae and Freddie Mac represented a significant percent of the US secondary mortgage market, particularly before and after the rise of private real estate asset-backed security market produced during the rise and fall of late 2000s subprime lending-era financial practices. These bodies have used this market influence to set rules for the broader home mortgage lending system. In the wake of the subprime era collapse in US secondary mortgage markets, this power has been the focus of a heated battle in emerging green lending proposals, as Fannie and Freddie have used it to block the use of property-assessed clean energy (PACE) loans in many residential real estate markets.

The aforementioned regulatory battle speaks to another dynamic in national governmental structuring of US real estate and real estate finance. The aftermath of major real estate-financial bubbles, including but not limited to the syndication and subprime bubbles discussed above, has been marked by various national political investigations into real estate appraisal practices and moves toward reform. (Of course, these waves of boom, bust, and regulatory remorse and austerity/reform measures have longer term precedents – see Teaford, 1984; McDonald, 1986; Weiss, 1991; Sbragia, 1996; and Scobey, 2003.) Fannie and Freddie's

recalcitrance in the current moment demonstrates a similar post-bubble attitude. Another post-subprime manifestation of this trend has been national investigations of real estate appraisal practice post-bubble. These inquiries echo a similar round of governmental questioning (evidently insufficient) carried out in the wake of the Savings and Loan bubble of the late 1980s. (A previous round of attempted reform that established the Appraisal Institute.)

⁴ For example, the Obama Administration's Better Buildings Initiative is working with the Appraisal Institute and Department of Energy to restructure national appraisal practices (e.g., EERE, 2011). Another national piece of legislation in this sphere is the proposed SAVE Act. And Freddie Mac administrators have attempted to leverage this secondary market institution's influence over national real estate markets to disseminate green appraisal, adding a sheet on green features to its forms.

⁵ As with the green economy's probable climate change mitigation and broader environmental regulation requirements more generally, this kind of governmental practice blurs the distinction between private and public command and control regulation by using mandated changes to buildings to grow private green building construction and retrofit markets and support the dissemination of certain certification models and support professions. We can see similar overlap – and at times confusion – in formal building codes. Voluntary energy and environmental building certifications rest their claims to higher performance upon a given baseline of general construction and remodeling practice; they must be made visible as exceptional buildings. In the US, these baseline standards vary by US state – and likely to a considerable degree within states – depending upon these sub-national governments' building codes and enforcement mechanisms. Some states have no official building codes at all, some have advanced energy requirements, some have additional green building provisions. Without national standardization, moves to reshape regional building markets will be difficult to compare against each other.

⁶ By both continued state protections and their material nature – e.g., that despite advances in prefabrication, it has remained impractical to produce buildings for international export.

⁷ We can see more concrete expression of this changing governmental role in US governmental attempts to support the emerging green real estate industries that are the primary focus of this dissertation. State structuring is equally critical in the US energy utility sector in some ways previously discussed – e.g., in the legal fictions of a “natural monopoly,” in the way expenditures and profits are structured in this high fixed capital industry, and in the legal permissions enabling demand-side management (DSM) approaches to energy service provision, among others. I have focused particularly on the state role in land and real estate markets, and their projected transformations. I argue that proponents of this green economic sector are working to create supportive state structures at the US national level. To protect the new kinds of value and intangible commodities by which they hope to profit, they are intervening in state calculative space in various ways. They thus propose to add another level of legal-regulatory architecture to a sector that is already heavily structured by the state – to keep private property in land functioning as a fictitious commodity and to enable the US's massive private real estate market.

⁸ This focus on contingent power relations and the current balance of powers between national governments more and less powerful and global finance emphasizes that the fears of governmental inadequacy in dealing with transnational GHG emissions are as much a reflection of political economic history as the nature of climate change. In a context in which free trade, transnational production, and mobile international capital were not present, fears of ungovernable transnational GHG flows would be greatly reduced. Emissions “leakage” from regulatory spaces to ungoverned economic spaces would be reduced or removed.

⁹ Like ozone depletion, although with emissions sources far more pervasively integrated into the reproduction of industrial societies, but different from an older model of environmental problem definition and regulation – although joining a range of regional transboundary problems like nitrogen cycle disruption (e.g., as manifesting in fertilizer runoff to watersheds and eutrophication

in the outlets of major river systems like the Mississippi) and acid rain (atmospheric sulfur dioxide pollution from high sulfur coal burning).

¹⁰ E.g., midlatitude countries with relatively robust water supplies, food/agriculture systems, and/or exposure to sea level rise, among other destabilizations projected as a result of climate change. Most models project more dramatic destabilizations for these places over the longer-term if climate change goes unmitigated. But with the most dramatic effects of emissions produced now not projected for decades from the present, the problem has fit poorly into political cycles/timescales.

¹¹ Global finance has gained and regained critical amounts of power to discipline, shape, and delimit national governmental action.

¹² E.g., see similar discussions about discourses of economic efficiency, generally around labor costs. Struggling industries are sensitive to these marginal cost changes in a way untroubled technological leaders need not be (even if compulsion to realize maximum possible profits mean that they drive down wages anyway).

¹³ Of course, trade controls beginning early after World War II; capital controls only much later.

Chapter 7

¹ And we should note that in 2008, cleantech was one of a limited number of potentially game-changing technological frontiers available to would-be economic planners in an economic era characterized by zero-sum competition and constrained profitability along a few key lines of export production (e.g., Brenner, 2006).

² See Smil, 2000 for an overview of this transition. The original New Deal was a complex and changing assemblage of institutions, individuals, and programs, ranging from immediate work-relief programs to more structural economic development policies; its agencies entrained broad sectors of the economy from agriculture to industry to the arts and geographically redistributed investment to sites across the US. And it joined a longer and still more complex/ideologically differentiated wave of US economic policies aimed at modernizing the country's economy and technological infrastructure for the twentieth century. These programs ranged from voluntarist antecedents in Hoovers' Progressive Era Department of Commerce and presidential administration through the rise of several evolutions of the New Deal's assembled coalition under Roosevelt, through World War II's whole-economy mobilization to subsequent Keynesian programs under Truman, Kennedy, and Johnson (Walker, 1977; Fraser and Gerstle, 1989). Unsurprisingly, today's Green New Deal advocates elide much of this historical complexity when they use the New Deal as a rhetorical symbol and organizing vision (e.g., Grunwald, 2012a, 2012b).

³ Earlier urban and Keynesian national programs also had a function beyond immediate employment relief – and defusing of dangerously building revolutionary ferment – and state preservation of hegemony and, at the extremity, existence. Stimulus alone provides a stop-gap but does not necessarily produce lasting jobs – complex economies need more lasting sources of surplus – technological super-profits, accumulation by dispossession, natural rents, etc. E.g., see Storper and Walker (1989) on these principles.

⁴ Timing of accumulation waves taken from Walker (1977).

⁵ Ferguson (1984, 1989) argues that besides the technological novelty of their products, these industries were united by their capital-intensive nature relative to the older Gilded Age suite; which besides its often-massive outlays for fixed capital (e.g., Chandler, 1977) required massive labor forces and provoked major labor battles. Ferguson points to this older bloc's bitter anti-union struggles of the 1920s and the new industries' increased willingness to consider welfare capitalist ideas⁵ as a precursor of their willingness to align with the New Deal. Scholars including Block (1977), Chandler (1977), and Domosh (2007) have tracked the nineteenth and early twentieth century multinationalization and foreign direct investment strategies of rising 3rd

Industrial Revolution industries, manufacturers like General Electric, International Harvester, and Singer who looked early to international markets and international production. Block (1977) and Ferguson (1984, 1989) discuss how these companies thereby developed largely divergent geopolitical interests from Gilded Age industries, represented in the protectionism of the old System of '96 and Republican Party. The new rising group of massive companies looked to trade liberalization to expand their markets. In the New Deal-Keynesian order, they formed the multinational bloc that, confident of its technological edge coming out of World War II, welcomed free trade policies (and simultaneously welcomed or tolerated capital controls and the global regulation of finance, discussed below) (Block, 1977).

⁶ Again, following Walker's (1977) classification of the waves of accumulation.

⁷ Henceforward, coal would continue to fuel electric generation and large industrial plants but cede its importance as a transportation fuel to oil in all realms – land, water, and air; natural gas had already largely replaced coal in home heating and cooking.

⁸ E.g., see Chandler (1977) on this wave of accumulation being more supported by the growth of mass markets than fundamental technological breaks – those had been effected before. See also Mokyr (1990) and Arrighi (2010).

⁹ “Green collar” job advocacy was also anticipated by other fronts of these interests’ previous crisis-era campaigns to regain ground lost to neoliberal policies since the 1970s – notably the union organizing drive that, given force by the early 1990s recession, helped elect Clinton to the White House.

¹⁰ Even as its immiseration – in the form of ongoing foreclosures, heightened racialized economic insecurity and unemployment, and widening inequality – have continued to challenge progressive solution envisioning and organization and simultaneously fuel right-wing reaction.

¹¹ And, of course, more traditional Marxist visions, although those possibilities have not been particularly remarked/emphasized. We can see indirect support for this kind of transformative program from left development studies activists, as critics of developing country GHG emissions offsets and biofuels schemes call for industrial countries like the US to effect energy-economic transformations at home.). Of course, this progressive-left edge of mainstream green economic organizing in the US thus retains many problems of ecological modernist visions. Adopting a language of growth widens its appeal and ability to build political coalitions but avoids discussion of some of the important trade-offs that effecting green collar jobs and green economic visions will require. Some of these issues might present themselves over the longer term. For example, green collar jobs visions would eventually have to wrestle with lessons from revelations about “toxic Silicon Valley” (e.g., Silicon Valley Toxics Coalition, 2013, and see Walker, 2008a) – i.e., that production processes in “post-industrial” industries or to produce green products (e.g., the problem of toxics and rare earth metal mining in solar panel production) might not itself be green or without harmful elements for workers. Conflicts over the environmental and geopolitical costs of solar panel production and rare earth mining – necessary for solar panel production as well as many other computer hardware and high tech applications – reproduce these concerns over a broader scale (e.g., Silicon Valley Toxics Coalition, 2009; Jenkins, 2013; Mulvaney 2013a, 2013b). As we will see, more immediate problems with green economic blocs’ reluctance to overtly discuss economic-environmental trade-offs have presented themselves from strategic battles with business-as-usual political economic interest groups, powerful in the US context. However, in the more immediate context of the Obama Administration’s organizing possibilities in 2008, this blue-green growth modernism presented important political opportunities for both the logic of capital and a revival of mid-century modernist rhetoric of state economic development capacity.

¹² See e.g., Hess (2012) for a more comprehensive policy survey.

¹³ In the late 2000s, private sector actors also took unprecedented interest in energy-efficient construction and renovation, jumping onto ideas for expanding energy retrofits beyond their

earlier ideological niche and low-income bases. And they expanded their focus to encompass more profound transformations of homes, commercial buildings, and broader built environments/urban landscapes for high energy performance. In the residential sector, one major arena for activity is the redesign of buildings from the ground up for high energy performance – performing significantly in advance of international energy standards for buildings and going well beyond the operational energy savings able to be achieved by weatherization or even more substantial remodeling efforts. Advance concepts include, for example, Zero Net Energy buildings and homes certified according to the German PassivHaus Institut’s certification scheme; superinsulated and with other advances in their building seals, “passive houses” are designed to be furnace-less and ductless. Other professional bodies who have become critical in this field globally include the Building Performance Institute, a major player in advancing home energy auditing techniques; driving non-profits institutions and research organizations like the Global Green Building Council (GBC), and energy efficiency standards-setting and real estate appraisal bodies including the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), the International Organization for Standardization (ISO), the Appraisal Institute, Royal Institute for Chartered Surveyors (RICS), and the Vancouver Valuation Accord.

¹⁴ As with many programs of the era, its vision was racially exclusive, an institutional racism embedded in state-supported redlining policies.

¹⁵ Pulling together the threads of this historical story is critical: that model is not just getting questionably repurposed by a US real estate/construction/finance bloc now but something similar is getting adopted now with China’s programs to increase domestic mass consumption, housing programs in Brazil and other rising countries, and other “global middle class” ideas emerging especially in BRIC countries now.

¹⁶ I.e. as much a fixed “improvement” to land as anything like a normal product.

¹⁷ Harris and Buzzelli particularly emphasizes the maintained locality of builders in smaller cities, towns, and rural areas, who stayed small even during the building booms that supported the consolidated activities of larger speculative builders and ultimately community builders, e.g., Weiss, 2002.

¹⁸ In any case, as climate change and other twenty-first century environmental problems can be confined less and less to traditional “first nature” boundaries and established resource spaces, successfully mitigating and adapting to them will demand whole-economy strategies even without market environmentalist forms of regulation.

¹⁹ (Potentially covered by PUCs under allowable expenses)

²⁰ More research is needed on both. Globalization has facilitated the fast and cheaper transport of heavy goods; perhaps including an expanded wholesale as well as retail trade in advanced building materials – surveys have already tracked Home Depot’s large share of 2000s-era container ship freight traffic. Conversely, previous “post-industrial” experience has raised doubts about the applicability of a comparative advantage in design and other professional services.

²¹ More research is needed on things like Big Box stores and the broader kind of exurban commercial strip and business park development that was also characteristic of this period.

²² And we should note here that these profits on land deals are taxed at the capital gains rates associated with financial transactions – lower as a result of neoliberal era changes than taxes on the profits of business.

²³ Further research is demanded on international interests as well, given major interest/construction booms and potential construction industrial innovations/transformations abroad – how a sustained boom like China’s or continuity manufactured via a globalization of the industry might avoid its historical problem of punctuated development.

²⁴ Although debate about the battles over this legislation continues. See discussion of Skocpol report below.

²⁵ Significant analyses by Bartosiewicz and Miley (2013) and Skocpol (2013) and place central blame for this failure to establish GHG emissions caps on the strategies of mainstream environmental organizations for failing to organize the grassroots and mobilize popular pressure – instead, relying on their neoliberal era tradition of behind the scenes negotiations with big capital; ultimately insufficient in this case. Another factor in this weak popular support were some grassroots organizations’ objections to the cap-and-trade instrument that was intended to be a central structure in this legislation, or to the specific corporate giveaways considered under this scheme. And Skocpol points to other unfavorable conditions like the rise of right-wing reaction with the Tea Party. Other commentators have placed more focus on the Obama Administration’s decision to prioritize health care rather than climate change legislation (e.g., Loewentheil, 2013; Pooley, 2013; Roberts, 2013; and see Grist staff, 2013). Grunwald (2012a, 2012b) argues that the administration is building the basis of change with programs like ARPA-E – i.e., creating a stronger pro-climate change mitigation bloc of industries and regions that would benefit from and push for emissions reduction policies, to balance out the existing industries and regions that would be forced into profound restructurings or driven out of business/work. This position is similar to Jones’ advocacy (2008; see also Mirpuri et al., 2009; see Newell and Paterson, 1998 and Levy and Egan, 2003 for other statements in this Gramscian vein²⁵) for the development and state promotion of a green industrial bloc. And the strategy bears important resemblance to the focus on contending energy-industrial blocs Bernstein (1989) and Ferguson (1984, 1989) bring to their analyses of the New Deal. In this light, the most striking difference in today’s context is the economic weakness and often-underdeveloped technological proposition of many cleantech/green economic industries relative to the bloc that aligned to support the New Deal; even more so than in Bernstein’s (1989) account, these industries have not been strong enough to meet entrenched fossil fuel interests head on – likely even more dependent on state development supports.

This take remains challenged by the administration’s ongoing support for the fossil fuel industry. Critics have charged that the Obama Administration has not sufficiently acknowledged the extent to which the conflict between twentieth and twenty-first century energy systems and industries must be zero-sum, considering their direct price competition in electricity and direct energy markets and fossil fuels’ historical cheapness (thanks in part to a long history of government subsidies). Analyses have singled out the administration’s uptake of natural gas as a “transition fuel” language²⁵ and support for the Keystone XL pipeline, among other policies. This issue of existing and new governmental support has become particularly heated in the context of the US’s unconventional fossil fuel boom. Taking off at approximately the same time as the wave of green economic promotion described above, this wave of extraction was a highly visible source of economic development and jobs during the recession – a difficult opponent, particularly in its ability to deliver energy at very cheap prices.

Many critics of the Obama Administration’s green economy-climate programs charge the administration for not backing up its rhetoric of hope with equally ambitious policy, and charge that its programs are thus falling far short of the efforts needed to effect a lasting economic transformation on the scale promised. Labor-environmental organizing pushes and hopes for renewed Democratic Party support have gone unrealized before – notably with the Clinton Administration’s passage of the North American Free Trade Act (NAFTA) and support for the World Trade Organization. However, failure in the current moment may also disappoint a cleantech capital fraction that cannot realize its accumulation visions without a thorough reworking of the US energy system and its fixed capital infrastructure. Critics particularly target the Obama Administration for caving to the fossil energy lobby as oil and gas industries have moved to protect their US energy market and support a major North American boom in unconventional fossil fuel extraction.

²⁶ At the time of this writing, Dodd-Frank legislation is still in the development and rollout stage, its ultimate effects remain unclear. However, so far it has not approached the comprehensive reforms of the sector effect after the Great Depression by Keynes and others.

²⁷ Besides the bloc of rising, often multinational industries described above, another critical component of the New Deal coalition was its particular negotiations with and disciplining of elite finance. In the late 1920s, the US financial system was awash in capital, some from its late nineteenth century industrial rise, some fleeing the political turmoil and monetary instability of interwar Europe (Block, 1977; Kindleberger, 1984). However, by the mid-to-late 1920s, the US's ability to find productive outlets in which to sink this capital had stalled; speculators instead sunk it into corporate, railroad, utility, and skyscraper stocks (e.g., Goetzmann and Newman, 2010) and a range of "secondary circuit of capital" real estate developments and schemes (Walker, 1977, pp. 485-6; see Harvey, 1982 for more abstract theorization of this circuit-switching). When these speculations failed broadly in the Depression – and likely helped hasten its coming (Goetzmann and Newman, 2010), the financial system risked collapse.

In this troubled era, major banks also cast their weight in with other elements of the New Deal economic coalition discussed above (Ferguson, 1984, 1989). According to Ferguson (1984):

"A flock of new (or suddenly growing) houses sprang up [in the 1920s] and began to compete for dominance with the established leaders: the House of Morgan and Kuhn, Loeb. In time these firms would produce a generation of famous Democrats: James Forrestal of Dillon, Read; Averell Harriman of Brown Brothers Harriman; Sidney Weinberg of Goldman, Sachs; John Milton Hancock and Herbert Lehman of Lehman Brothers...in commercial banking, rivals also began to contest Morgan's position. The Bank of America rose rapidly to become one of the largest commercial banks in the world. Though the competition did not yet take partisan form, the bank bitterly opposed Morgan interests, which attempted to use the New York Federal Reserve Bank against it...with workers, farmers, and many industrialists up in arms against finance in general and its most famous symbol, the House of Morgan, in particular, virtually all the major non-Morgan investment banks in America lined up behind Roosevelt. And, in perhaps the least appreciated aspect of the New Deal, so did the now Rockefeller-controlled Chase National Bank" (1984, pp. 70-72; 81).

Critically, Block (1977), Kindleberger (1984), Eichengreen (2008) and other economic historians argue that high finance's Great Depression-era weakness and the US's withdrawal from the Gold Standard's imposed fiscal austerity (and the industrial leadership and massive domestic market that gave the US the relative self-sufficiency to do so) gave the Roosevelt Administration necessary freedom to undertake unprecedentedly massive national stimulus programs and to go into debt to do so. In undertaking long-term infrastructural investments in the depth of the Great Depression, the Roosevelt Administration did not just alter the US's own governmental traditions, dramatically enlarging and reworking the structure of the state in the process. It also bucked existing assumptions about capitalist state behavior, which demanded fiscal austerity as a response to crisis – under the Gold Standard system, prioritizing the return of capital domestic and international creditors was meant to be so hard-wired into governmental priorities as to be unquestionable (Kindleberger, 1984; Eichengreen, 2008).²⁷

These financial power politics brought important capital behind the Roosevelt Administration. And the administration used this arrangement and the relative disarray of finance capital to regulate the financial system, domestically and, with the post-World War II rollout of a Keynesian international monetary order, internationally (Block, 1977; Kindleberger, 1984; Helleiner, 1994; Gowan, 1999; Eichengreen, 2008). The organizing principle of this disciplining of finance capital was that finance should serve the needs of the state, not vice versa; the overall structure of post-World War II finance and monetary systems was highly state-centered (e.g., Gowan, 1999; Ingham, 2004). This discipline of finance adhered critically served the New Deal-Keynesian state's need for infrastructural investment to support mass production and

consumption – including the (sub)urbanization dimensions to that mass consumption promotion reviewed above. Internationally, the postwar Keynesian order imposed capital controls and inaugurated the Bretton Woods institutions to replace/mediate *haute finance* as a lender to states.²⁷ Domestically, the Glass-Steagall Act partitioned the US financial system, separating investment banks and their elite and higher risk activities from the commercial banking and local/regional mortgage lenders that were to serve the basic needs of mass consumption – including an unprecedented rise in long-term working class debt, undertaken in large part to support the purchase of new electrically modern homes (e.g., Walker, 1977, 1981; Jackson, 1985; Tobey, 1997).

More specifically, as the financial system faced few opportunities for profitable investment and political challenges from many directions, the US state could command highly patient capital investment, compelling financiers to wait years or more for return on their investments and keeping interest rate expectations moderate – the kind of strong state power needed to discipline finance, as the most potentially footloose fraction of capital. In this spatio-temporal fix (see Harvey, 1982, 2003), the New Deal-Keynesian state saved capital in general from devaluation, speculating that its infrastructure investments would reestablish accumulation on a new and higher basis postwar (part of a US strategy to prevent the return of Depression conditions postwar that also included the Marshall Plan and the rollout of other development policies, aid to the multinational industrial bloc as well as the US balance of payment – e.g., see Block, 1977).

This era of New Deal-Keynesian (and European embedded liberal – e.g., Block, 1977, and developmentalist) capital controls and financial regulation muted longer-term tensions in the relationship between productive capital and finance, and between governments and finance. Again using the language of the spatial fix and spatio-temporal fix, Harvey (1982, 2003) describes the forces of capital that undo waves of geographical investment like the New Deal-Keynesian one – and that, without its kind of strong state apparatus, make finance capital's potential for footlooseness and propensity for impatience work against its successful long-term deployment for productive accumulation or state development. As much as long term spatio-temporal fixes and periods of patient capital investment can be demonstrated to have been essential to the ongoing reproduction of capitalism, they can simultaneously be unbearable burdens to individual capitals in competition, again particularly finance capital as a fraction. Capital at rest or uncompetitively invested is capital devalued; capital(ists) outcompeted. Harvey argues that capital's compulsion to try to escape fixed capital investment into a more liquid form drives omnipresent threats of geographical creative destruction, in capitalism in general – i.e., the long *durée* geographical shifts, industrialization, and creative destruction analyzed by Storper and Walker (1989) and Arrighi (2010), among others – and in the current world system post rollback of Keynesian/rollout of neoliberalism in particular.

²⁸ Many scholars now employ the term financialization, but they refer to slightly different things when they do so (Lee et al., 2009).

²⁹ This decisions also bolstered the centrality of the US and Wall Street in the financial system, as investors in a financially riskier world sought the stability of the US dollar – backed by faith in the US's ongoing relative economic and military strength and the strength of Wall Street (Gowan, 1999).

³⁰ The collapse of the US's 2000s-era building boom, its subprime loans, and the financial structures dependent upon investment banks' elaborate financial architectures raised profound questions about these arguments. Post-collapse analyses showed that Chinese capital had critically kept the bubble inflated, via direct purchase of mortgage-backed securities, and through purchase of US sovereign debt (thereby keeping interest rates low). Although this strategy made sense in light of China's then-need for the US markets for its production, this kind of subsidy to the US's increasingly leveraged economy seems near if not past its expiration point. As the

country faced a crisis unprecedented since the Great Depression, Bush's Troubled Asset Relief Program (TARP) rescued financial institutions to the tune of \$418 billion (funds actually disbursed; \$387 billion had been paid back by December 2012) (US Treasury Department, 2013). Besides state-mediated financial institution buyouts and restructurings during the crisis, the federal government attempted to discipline the financial industry with the passage of the Dodd-Frank Act in 2010. Although the restructured financial institutions that emerged from the 2008 collapse and government bailout have had troubles of their own (e.g., IMF, 2012), these institutions have not been made subject to anything comparable to Keynesian-era financial disciplining. At the time of its passage, Dodd-Frank was promoted as the most ambitious financial reform since the New Deal-Keynesian restructurings. However, critics point to the long-belated rollout of its provisions (still delayed three years later at the time of writing), its failure to approach the scale – both domestic and international – of changes needed (e.g., Block, 2011), and strong resistive financial industry lobbying to argue that this legislation will not effect the thoroughgoing transformation needed to mute global finance's speculative drives (e.g., Wilmarth, 2010-2011; Moore, 2013; DavisPolk, 2013) More broadly, critics have charged that the federal government failed to use these substantial governmental bailouts and the crisis context as leverage to more fundamentally reform the financial industry. Suskind (2011) critiqued the Obama Administration's mental capture by Wall Street interests including Lawrence Summers (although see also Grunwald 2012a, 2012b).

³¹ Davidoff (2012): "According to SNL Financial, four banks each had more than a trillion dollars in assets at the beginning of the year. JPMorgan Chase was the largest with \$2.3 trillion in assets, while Bank of America had about \$2.2 trillion in assets and Citigroup, \$1.9 trillion. Goldman Sachs is fourth with about \$950 billion in assets...not only are the banks big, their share of the market has grown. In the 1980s, the 10 largest banks had less than 30 percent of bank depository assets. By 2012, this amount had almost doubled to 54 percent."

³² The US faced potential international financial disciplining via sovereign debt and currency markets, as other countries and economic units have been proposed as preferential investments, other currencies effective world currencies to replace the dollar. These struggles have high stakes for relative governmental freedom of action, as the US's freedom to take on new debt and subsidize low economy-wide interest rates (critical fuel for subprime lending as in the US's last few speculative bubbles – Brenner, 2009) was shaped by its strong government securities and currency position (and see Block, 1977; Gowan, 1999). However, the US's internal pressures for austerity are at least as important. A critical way in which finance has disciplined US governmental policies in the current period has been via the maintenance of austerity logics within government operation. In the current context, these pressures have been most evident in state and local government fiscal crises (e.g., Krugman, 2012; Peck, 2012, 2013). US cities and the subnational bond market have been frontlines for financialization and sites of austerity pressure (with the two processes connected in complex ways). But we can also see pervasive austerity assumptions in the partisan fiscal battles that have marked the early 2010s – arguments over the "fiscal cliff," sequestration, and other policies (Crotty, 2012; Pollin, 2013). And we can track the more structural influence of neoliberalism's financial rollout in the dissemination of calculative logics throughout US governmental decision-making, e.g., in the tightening of cost-benefit analysis requirements for federal programs (e.g., Lohmann, 2009; Makowsky and Wagner, 2009). This kind of financial imperative is subtler than the overt attacks on social spending made by tax hawks like Grover Norquist, rejuvenated with the organizing of the Tea Party movement. Cost-benefit requirements and government "efficiency" procedures are more axiomatically – and therefore inconspicuously – structured into the government's operating procedures by decades of neoliberal rollout. For example, we can see some of these pressures in the acute economic efficiency scrutiny of Obama Administration recovery programs. These assumptions shape thinking about the role of public versus private economic investment in an

ongoing basis, i.e. as encoded in “bringing to scale” language: when recovery funds are meant to stop, and when “business as usual” private financing is intended to kick in.

Chapter 8

¹ Experience has been that cities lack authority/police power over many things needed for climate change mitigation and/or green economic development – for example, Fannie Mae rules; financial structures and capital flows; lack of power to compel e.g. US regions who are major emitters and who would not opt in. They have only the power to try to refuse their products, and that is highly limited. Much happening to provision cities actually falls under more national level authority; the main power of “cities” would be as informed consumers – which despite green procurement arguments is arguably not much power at all. We can see some of these limitations built into the structure of urban greenhouse inventories themselves. For example, they typically do not include things like large industrial plants, even sometimes power plants; let alone try to figure out how to deal with the more life cycle/supply chain emissions footprint of all the things consumed in cities and produced elsewhere. Framings of how to tackle climate change that can dominate when the problem is conceived of at the urban are real estate, infrastructure energy use, and other emissions that loom large in the more urban inventories that they can create. Although cities may have somewhat more control over these urban emissions, they gain this power via indirectly concealing emissions that arise from their embeddedness in larger territorial and global economic systems. Even when sticking to more urban-centric framings of climate change like the green buildings policies discussed in this dissertation, we can quickly spot the limits of the policy power that cities can wield (formally or practically). See Knuth (2010) for more discussion about how federalist division of powers can restrict cities’ control over urban emissions production, difficulties that highlight why cities’ own buildings have been such flagships for green building programs (i.e., it is the only sphere over which many jurisdictions actually can exert police power).

² Although this varies considerably by legal geography. For example, in California, certain jurisdictions are able to justify the creation of PACE districts based on original Progressive Era special district-enabling legislation from 1911; others must defend these new districts via their resemblance to the much newer Mello-Roos “dirt” bond form pioneered in the financing of infrastructure for suburban subdivisions.

³ Note: more research is needed to track these forms’ connections to current para-statal organizations in developing countries; e.g., Goldman (2011).

⁴ Drawing on but substantially adapting earlier political science theories of policy transfer, this body of scholarship aims to track how policies are being transmitted across places, particularly urban areas in a global political economy that is being rapidly reworked – to compete for faster flowing capital, around the repositioning of Global South cities as part of emerging markets, with the professionalization of an international consulting class to transmit and standardize economic development tools and visions, and to provide platforms for global investors to inter-compare different markets. In the fragmented US federal system, questions of policy mobility have long been foci of politics and academic examination at various subnational scales, including but not limited to the urban.