12-2016

Shades of Green: A Comparative Analysis of U.S. Green Economies

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I am submitting herewith a dissertation written by Jenna Ann Lamphere entitled "Shades of Green: A Comparative Analysis of U.S. Green Economies." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Sociology.

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A Dissertation Presented for the
Doctor of Philosophy
Degree
The University of Tennessee

Jenna Ann Lamphere
December 2016

Acknowledgements

I would like to give a special thanks to my dissertation chair and committee for their support throughout this project. They have spent many hours reading and commenting on various iterations, and without their contributions, this work would not be possible. While I especially want to thank Jon Shefner, who has been an unparalleled influence, Robert Emmet Jones, Sherry Cable, and Alex Miller also gave significant time and guidance. I am grateful for their counsel.

I am also grateful for my parents, Judene and Gerald Lamphere, and their much and varied support over my several years of schooling. Without their ongoing encouragement and care, I am not sure I would have made it through the trials and tribulations of graduate school. Lastly, I would like to thank my grandmother, Lucille Lamphere, who was also a consistent and unforgettable source of support.

Abstract

Recent attention from scholars, policymakers, and practitioners has focused on the importance of green economy development in achieving sustainability. Efforts, however, have been complicated by the lack of agreement on what a green economy is or how to transition to one. Drawing insights from environmental sociology, new state theory, and science and technology studies, I conduct a comparative analysis of select U.S. cities with recognized green economies. Findings indicate that in each economy, the strength and role of institutions and actors is unique, forming distinct networks that vary in their pursuit of socio-environmental goals.

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List of Acronyms

ACC	Austin Community College
AECC	Arkansas Electric Cooperative Corp.
AEGB	Austin Energy Green Building
ARRA	American Reinvestment and Recovery Act
AMBC	Appalachian Mountain Bike Club
ATI	Austin Technology Incubator
AUA	Advocates for Urban Agriculture
BLS	U.S. Bureau of Labor Statistics
CAC	Knoxville-Knox County Community Action Committee
CDA	Chicago Department of Aviation
CAFE	Corporate Average Fuel Economy
CMA	Strawberry Plains Career Magnet Academy
CAMPO	Capital Area Metropolitan Planning Commission
CDOT	Chicago Department of Transportation
CMAP	Chicago Metropolitan Agency for Planning
CNG	Compressed Natural Gas
CSA	Community Supported Agriculture
CTA	Chicago Transportation Authority
CTE	Career and Technical Education
DOE	U.S. Department of Energy
EDA	U.S. Economic Development Administration
EECBG	Energy Efficiency and Conservation Block Grant
EIA	U.S. Energy Information Administration
EPA	U.S. Environmental Protection Agency
EV	Electric Vehicle
GACC	Greater Austin Chamber of Commerce
GDP	Gross Domestic Product
HBAGLR	Home Builders Association of Greater Little Rock
IACMI	Institute for Advanced Composites Manufacturing Innovation
IMF	International Monetary Fund
ISWM	Integrated Solid Waste Management
KAT	Knoxville Area Transit
KCC	Knoxville Chamber of Commerce
KEC	Knoxville Entrepreneurial Center
KEEM	Knoxville Extreme Energy Makeover
KUB	Knoxville Utility Board
LCA	Life-Cycle Assessment
LEED	Leadership in Energy and Environmental Design
LOIS	Locally Owned Import Substitution
MLP	Multilevel Perspective
NABCEP	North American Board of Certified Energy Practitioners
NAC	National Apprentice Certification
NNMI	National Network for Manufacturing Innovation
NREL	National Renewable Energy Laboratory

OECD	U.S. Organization for Economic Co-operation and Development
ORNL	Oak Ridge National Laboratory
PACE	Property-Assessed Clean Energy
PILOT	Payment in Lieu of Taxes
PlanET	Plan East Tennessee
PPT	Political Process Theory
PSCC	Pelissippi State Community College
PV	Photovoltaic
RTA	Regional Transportation Authority
SACE	Southern Alliance for Clean Energy
SAPs	Structural Adjustment Programs
SFPB	Sustainable Food Policy Board
STEM	Science, Technology, Engineering, and Mathematics
STS	Science and Technology Studies
SUACG	Sustainable Urban Agriculture and Community Garden
TIF	Tax Increment Financing
TINA	There Is No Alternative
TOD	Transit-Oriented Development
TSI	Tennessee Solar Institute
TVA	Tennessee Valley Authority
UALR	The University of Arkansas, Little Rock
UAMS	The University of Arkansas Medical Sciences
UN	United Nations
UNEP	United Nations Environmental Program
USCB	U.S. Census Bureau
USGBC	U.S. Green Building Council
UT	The University of Tennessee
UTGI	The University of Tennessee's Green Economy Initiative
UTRF	The University of Tennessee Research Foundation
WAP	Weatherization Assistance Program
WBC	World Business Chicago
WMI	Waste Management, Inc.
WWF	World Wildlife Fund

Chapter 1: Introduction

The importance of green economy development rests in its potential to mitigate the catastrophic effects of two major crises: rapid environmental degradation and inequitable development (Hess 2012; Klein 2011; Lamphere and Shefner 2015). Damages from rising greenhouse gas emissions, land loss from deforestation and desertification, water shortages, and loss of biodiversity, among declines in other natural systems, are already felt across continents, and continued degradation is likely to have severe, pervasive, and irreversible impacts (Barrows 2014; Field 2014). When these trends are coupled with human development stressors, such as poverty, social instability, inequality, and the loss of local knowledge and traditions, the shortcomings of the current economic system and the threat of societal collapse are clear (Richardson 2013).

Recent works by scholars (Barbier and Markandya 2013; Simpson and Zimmerman 2013), policymakers (United Nations [UN] 2011a; U.N. General Assembly 2010), and practitioners (Danaher, Biggs, and Mark 2007; Makower and Pike 2009) focus on the importance of green economies in achieving sustainability. Efforts, however, are complicated by the lack of consensus on what constitutes and how to transition to a green economy. Research, much like that on sustainability, has tended to be a-theoretical and non-cumulative. Using a mix of original and secondary data, this research examines the foundational characteristics and development pathways of select U.S. cities with recognized green economies. Understanding characteristics and pathways is needed to advance theory and inform decisions regarding the management of large-scale transitions towards sustainability.

Background

Since the 1970s, the scope and magnitude of socio-environmental problems has accelerated to an unprecedented extent (Jorgenson and Kick 2006; Lamphere and Shefner 2015). Several scholars have attributed this acceleration to the process of neoliberal globalization (Harvey 2005; Klein 2014). Although its definition is debated, there is widespread agreement that "neoliberalism at a global level is the new power of owners of large, multinational corporations that benefit from economic policies associated with innovation, trade, liberalization, reduced government spending on entitlements, and decreased state restrictions on labor, health, and environmental hazards of production" (Moore et al. 2011: 507; c.f., Campbell and Pederson 2001; Harvey 2005; Sklair 2001). When considered broadly, the term is useful in understanding the reform that occurred after the economic downturn in the 1970s and the decline of Keynesian economics.

After World War II, much of Western Europe and the United States embraced fiscal and monetary policies, labeled "Keynesian," which focused on full employment, economic growth, citizen welfare, and state intervention (Harvey 2005). Such policy worked well during the high-growth years of the 1950s and '60s, but began to break down in the 1970s, following a series of oil shocks, increased stagflation, the dissolution of the Bretton Woods system, and fiscal crises for many states (Harvey 2005). As capital accumulation stalled, global leaders polarized; social democrats argued for greater state control, while a new conservative right rose, arguing for free markets and less state intervention. Fueled by the "Chicago boys," economists enthralled with von Hayek, Mises, Friedman, and others, and backed by powerful institutions, such as the

International Monetary Fund (IMF), World Bank, and U.S. Treasury, neoliberalism emerged as an antidote to seeming threats against the capitalist system.

Neoliberal globalization first entered into practice in Chile during the 1970s, and was introduced more broadly a decade later in the Reagan-Thatcher era (Harvey 2005; Moore et al. 2011). What followed was long series of deregulation, foreign direct investment, privatization, budget cuts, and trade union assaults. Although neoliberal policies were softened by "third-way" reforms during the Clinton administration and Blair ministry, several policies were introduced, such as the North American Trade Agreement and the Financial Services Modernization Act, which accelerated the process of neoliberalism. This process has entailed much "creative destruction" (el-Ojeili and Hayden 2005; Harvey 2005). Neoliberal globalization has: challenged state sovereignty; fueled the growth of the multinational corporation; reorganized industry and the division of labor; diminished welfare provisions; and, exacerbated inequality. It has not, however, been met without resistance, as evident by Peck and Tickell's (2002) "roll-back, roll-out" neoliberalism (c.f., Rowland 2013). Nonetheless, by force or otherwise, nearly every country has adopted, at least in part, the central tenets of neoliberalism (Harvey 2005).

The profound effects of neoliberal globalization are linked to the synchronous process of deindustrialization, which some scholars argue it induced (Alderson 1999; Bluestone and Harrison 1982; Harrison and Bluestone 1982; Wood 1994). With the advent of deindustrialization in the 1970s, developed countries experienced a sharp decline in manufacturing jobs. In particular, trade and finance liberation (Wood 1994), the acceleration of foreign direct investment (Bluestone and Harrison 1982; Harrison and Bluestone 1988), and the deregulation of the multinational corporation (Alderson 1999),

reduced the profitability of northern manufacturing, directing new investments toward developing countries where labor costs tend to be lower and regulations weaker. Improvements in communication and transportation technologies also fueled the movement (Sassen 1991). The flow of manufacturing jobs from the global north to the south had similar effects: in the north, the manufacturing jobs that previously fueled a robust middle class were replaced with service sector jobs, which tend to have lower pay and little security; in the south, manufactures tended to relocate in export processing or free trade zones where production costs are cheap and largely unregulated; in both, profits were usurped by corporate elites and inequality deepened (Harvey 2004, 2005; Moore et al. 2011).

Likewise, neoliberal globalization wrought havoc on the environment (see Gellert 2006; Jorgenson and Kick 2006; Klein 2014). With the expansion and intensification of social and material relations, a phenomenon Harvey (2005) refers to as time-space compression, neoliberal globalization has accelerated a growth dynamic depended upon unbridled accumulation. In a process Harvey (2004) refers to as "accumulation by disposition," northern corporate elites, either through foreign direct investment or IMF-enforced structural adjustment programs (SAPs), raided southern economies (i.e., largely in Latin America and South East Asia) and appropriated their assets. With the loss of sovereignty and the imposition of SAPs, such states had little choice but to privatize resources and sell them to the highest bidder. Environmental flows scholars (Bunker 1996; Bunker and Ciccantell 1995; Urry 2003; c.f., Mol and Spaargaren 2002; Schnaiberg 1980) have sought to capture this phenomenon, illustrating how neoliberal globalization has accelerated not just the movement of environmental resources from

south to north but also pollution from north to south (see Frey 2006). Others (Kentor and Grimes 2006; Klein 2014; York and Rosa 2006) have demonstrated the impact of neoliberal policies on carbon dioxide emissions and other contributors of climate change. Even the U.S. Environmental Protection Agency (EPA 2015) admits that since 1970s, global carbon dioxide emissions have risen by 90 percent, with those from industrial production and related consumption accounting for nearly 80 percent of the increase.

Global efforts to address exacerbating socio-environmental problems are not new. In 1983, the United Nations established the Brundtland Commission to identify global sustainability trends and growth strategies. Armed with the resultant report, *Our Common Future*, global leaders convened the 1992 Earth Summit in Rio de Janeiro, seeking to put its suggestions into action. There have been several subsequent gatherings, each seeking to generate action to confront impending socio-environmental crises: the 1997 "Rio+5" Earth Summit, 2002 Johannesburg World Summit on Sustainable Development, 2012 "Rio+20" Conference on Sustainable Development, and, 2015 U.N. Conference on Climate Change. What has followed is a series of non-binding agreements, which have largely failed to address mounting socio-environmental problems. This failure has recently prompted many global leaders to identify the urgent need for greater political commitment to sustainability (Bar et al. 2011; Brand 2012a; Lamphere and Shefner 2015).

Although use of the term "green economy" can be traced to 1989 with the publication of *Blueprint for a Green Economy* (Pearce et al. 1989), its was sparingly invoked until 2008 when it was introduced as a response to global financial and environmental crises (Ehresman and Okereke 2015; Runnalls 2011; Wanner 2015). The

2008 financial crisis was the most severe since the Great Depression (Helleiner 2011; Tienharra 2010), resulting in the collapse of major financial institutions and trade across the globe, as well as contributing to a 20 percent jump in unemployment (International Labor Organization 2010). At the same time, a flurry of research reports were published, warning of the imminent threats from exacerbating environmental crises (c.f., U.N. Environmental Program [UNEP] 2007, 2009; World Wildlife Fund 2008). Most notably, the Intergovernmental Panel on Climate Change published its fourth assessment, warning that the effects of climate change were already felt worldwide and that adaption strategies were sorely underdeveloped (Pachauri and Reisinger 2007). Amidst this confluence of crises, the concept of greening economies, as a solution for mitigating the socio-environmental effects of neoliberal globalization, started gaining global attention (Anton 2011; Bar et al. 2011; UN 2011a).

In response to mounting crises, governments around the world pledged nearly $3 trillion in fiscal stimulus packages, of which approximately 14 percent was earmarked for green investments (Luke 2009). In March 2009, the UNEP issued its influential "Global Green New Deal: Policy Brief," which sought to coordinate national stimulus plans by identifying key strategies for a green economy transition (Barbier 2010a; Luke 2009). The brief urged governments to prioritize energy efficiency, clean energy, agriculture, and freshwater management (Barbier 2010b). Several nations stepped up to the challenge and adopted green growth strategies, including China, Japan, Germany, the Republic of Korea (UNEP 2011), Australia, United Kingdom, New Zealand, and more (Luke 2009). So too has the European Union with its Europe 2020, which aims to build "a smart, sustainable, and inclusive economy" (European Commission 2016).

The United States also launched a "Green New Deal" (Luke 2009), starting with the 2007 Green Jobs Act, which authorized $125 million for green jobs training (Jones 2011), and greatly reinforced by the 2009 American Reinvestment and Recovery Act (ARRA). Of the $831 billion stimulus package, $90 billion was invested in tax incentives, loan guarantees, and other programs for green industries, and over $48 billion was invested in education and training for green jobs (Martinson, Stanczyk, and Eyster 2010). According to White House estimates, ARRA saved or created 6 million job-years, which averages to 1.6 million jobs per year (Furman 2014). Furthermore, ARRA improved over 40,000 miles of roads and 2,700 bridges, brought 693 water systems servicing over 48 million people into compliance, made high-speed Internet available to 20,000 community institutions, and much more (Furman 2014). Although returns on investment are diminishing and estimated to range between zero and 0.2 percent after 2016 (Congressional Budget Office 2015), some argue ARRA laid the groundwork for a stronger and more sustainable future economy (Furman 2015). Others, however, argue that ARRA investments were too small, too politicized, and too short-lived to be effective (Barbier 2010b; Krugman 2014; Stiglitz 2009).

Research Problem

Currently, the United States ranks first in world-wide petroleum consumption (U.S. Energy Information Administration [EIA] 2013a), imports more crude oil than any other country (EIA 2013b), and emits 16 percent of global emissions, despite housing only five percent of the world's population (EPA 2011). While the U.S. federal government has recently engaged in a number of pro-environmental acts (e.g., 2007 Green Jobs Act, 2009 ARRA, 2015 Clean Power Act, 2015 rejection of the Keystone

pipeline, etc.), U.S. cities have an especially important role in helping a global transition to green economies: over 80 percent of the U.S. population lives in cities (U.S. Census Bureau 2010a); most industries, the world's greatest polluters, are located near cities (Bai 2007); cities are open systems, depending on outside regions to provide inputs and absorb waste (Bai 2007); cities are the most basic unit of policy (Nevens et al. 2013); agency, among individuals and institutions, is most influential at the local level (Nevens et al. 2013); and, cities have one of the most direct roles in ensuring community needs are met (Boyle et al. 2013; Saha 2009). Additionally, several prominent U.S. cities are "global," providing locales for concrete, localized processes through which globalization exists (Sassen 1991, 1996).

U.S. city leaders have responded differently to socio-environmental pressures, forging unique pathways towards greener economies. While there are several case-study analyses on green companies, initiatives, and alike, there exist few studies that comparatively examine green growth in U.S. cities (Muro, Rothwell, and Saha 2011; c.f., Bai 2007; Cohen and Ilieva 2015; Hess 2014; Markard, Raven, and Truffer 2012). The lack of standardized definitions and data, coupled with the trend of a-theoretical and non-cumulative research has left several important questions unanswered: (a) what are the fundamental characteristics of green economies; (b) how do growth patterns impact the communities in which they are located; and, (c) what are their corresponding development pathways?

Description of the Study

Taking U.S. cities as the unit of analysis, this study examined four locations recognized for their greening economy: Austin, TX; Chicago, IL; Knoxville, TN; and,

Little Rock, AR (see Muro, Rothwell, and Saha 2011). These sites were chosen for theoretical and pragmatic reasons. I chose Knoxville as my in-depth case, first, because of my ease of access (i.e., I live there), and also because it has the fastest growing and second largest per capita green economy in the nation (see Muro, Rothwell, and Saha 2011). I chose Chicago as a primary contrast, also because of its high-growth rate, but additionally because it provided a sharp contrast to Knoxville (e.g., differing in size, region, political climate, etc.). Austin and Little Rock both have high-growth green economies and serve as secondary contrasts, sharing more similar characteristics with Knoxville than Chicago. Drawing on four years of fieldwork experience, over 65 semi-structured interviews, 15 focus group discussions, and extensive archival and survey research, I examine the strengths, roles, and socio-environmental justice-related impacts of green economy institutions and actors in each city.

In the next chapter, I discuss the small but bourgeoning literature on the green economy, as well as my conceptual framework. As previously mentioned, the wide-use of the concept "green economy" is recent (i.e., since 2008), and as such, lacks a well-developed literature or conceptual framework (Martinson, Stanczyk, and Eyster 2010; Wanner 2015). In this chapter, I review the growing academic literature, as well as public policy discourse, to discern the array of conceptualizations offered for the green economy. Drawing theoretical insights from a variety of perspectives, including transition theory (see Geels 2002; Geels and Schot 2007; Rip and Kemp 1998), Block (2008) and other's (Block and Keller 2011; Mazzucato 2014) work on the state, and Hess's (2007, 2009, 2012, 2014) research on sustainability pathways, I present the conceptual

framework I developed to understand the green economy institutions and actors in each city.

In Chapter 3, I discuss my research methods, which include a section on data collection and analysis. As mentioned above, case studies were selected based on theoretical and practical criteria, and data collection was mixed-methods, including archival, field research, focus group, interview, and survey research. Data was analyzed first by considering the unique attributes of each case and then conducting an across-case analysis.

Chapter 4 presents the results of my in-depth analysis of Knoxville, TN. I unpack the history of Knoxville's green economy development, illustrating how ARRA opened political opportunities at the federal level that progressive City leaders were able to garner to fund some of the area's first green projects. Those projects, along with others from local institutions, which also were funded with stimulus money, jumpstarted the green wave in Knoxville. The story of Knoxville's green economy illustrates how federal investments can have a big impact on the local level.

Chapter 5 presents the results of my comparative analysis. I begin with an overview of each city's landscape, illustrating the demographic, macroeconomic, cultural, and environmental characteristics that shape green growth. I then offer a case-by-case analysis of how landscape characteristics impact regime actors and niche-innovators, forming unique configurations and development pathways. In Knoxville, for example, green growth largely lacks public involvement and is driven by City efforts. Conversely, in Austin, growth is steeped in a long and contentious history of mobilized publics. Overall, the analysis suggests that although green growth requires efforts from a

similar and core group of institutions and actors, the role each plays is diverse, differing by case.

Chapter 6 provides a discussion of the results, answering the question, so what does this mean? I unpack that question first by discussing the limitations of the study and then contributions to scholarly literatures. These include literatures on the green economy, sustainability transitions, and new state theory. Next, I address implications for praxis and policy. I conclude by highlighting possible avenues for future research.

Chapter 2: Literature Review & Conceptual Framework

"Shunning the call for sustainability would not simply be a missed economic opportunity. It would be tantamount to a death sentence for large portions of the world's population" (Ross 2010: 41).

"There is nothing so practical as a good theory" (Lewin 1951: 169).

While the need to transition towards a more sustainable economy is hardly disputed, the degree of transition needed and the means for achieving it are contentiously debated (Ehresman and Okereke 2015; Gorden et al. 2012). According to some, only incremental change is needed, and it is the best brought via innovation induced by free market competition (Easterbrook 1995, 2003; Lomborg 2001, 2007; Simon 1996). Others (Bowen and Fankhauser 2011; Davies and Mullin 2011) starkly disagree, arguing for revolutionary change predicated on structural justice. Still others (Jones 2009; White, Dresser, and Rogers 2006) advocate for a middle ground, calling for system reform that is grounded in the protection of socio-environmental wellbeing. In the first section of this chapter, I review the new but bourgeoning academic literature and political discourse on green economies and identify three distinct conceptualizations or, as I refer to them, shades of green.

Next, drawing on scholarly literatures from environmental sociology, political economy, and science and technology studies (STS), I present the conceptual framework I developed for understanding the role institutions and actors play in greening economies. Like there is no agreed-upon understanding of "green economy" (Bar et al. 2012; Martinson, Stanczyk, and Eyster 2010; Wanner 2015), there is no well-established

conceptual framework. My framework is heuristic, serving as a foil for conceptualizing and operationalizing the different shades of green economies.

I finish with a discussion of the conceptual limitations of the framework, and its implications for research. The framework, being deeply influenced by transition theory (see Geels 2002; Geels and Schot 2007; Rip and Kemp 1998), suffers from similar limitations. First, the framework struggles to problematize power between and among institutions and actors. Understanding power is essential to managing transitions, so to help address the limitation, I follow Grin and colleagues' (2011) suggestion to incorporate insights from political economy, particularly those from Block (2008) and others' (Block and Keller 2011; Mazzucato 2014) work on the state. The framework is also based on technological innovation and tends to neglect social dimensions of change, such as alternative modes of worker-capitalist relationships like B-Corporations. I find Hess's (2003, 2007, 2009, 2012, 2015) research on sustainability pathways especially useful for understanding the diverse patterns of green growth. Also, the framework is modeled on research with a European and national focus (see Hess 2014; Markard et al. 2012). My research, with its comparative analysis of U.S. cities, helps address that limitation.

Shades of Green: Green Economy Literature and Public Discourse

There exists no scholarly or political agreement on what a green economy is or how to transition to one (Bar et al. 2012; Martinson, Stanczyk, and Eyster 2010; Wanner 2015). Most interpretations, however, take the Brundtland Commission's famous definition of sustainability, that is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World

Commission on Environment and Development 1987), and its three-pillar approach, that is "economic development, social development, and environmental protection" (United Nations [UN] n.d.), as the starting point. Where green economy understandings tend to differ is on their emphasis, particularly the degree of transition needed and the means to achieve it. In a review of academic literature and public policy discourse on the green economy, I delineated three distinct conceptualizations. Table A.1 provides an overview of these three shades of green.

Light green economies

Light green economy advocates are generally supporters of the status quo, arguing that incremental change is needed. As evidence, proponents often point to industrial countries and the significant improvements in air and water quality, sanitation, pollution reduction, and more that have occurred alongside increased wealth over the last 150 or so years (Ehrsman and Okereke 2015). Often cited is the Environmental Kuznets curve, which models the alleged positive relationship between environmental quality and wealth at later stages of economic development (Gross and Krueger 1991; Bao et al. 2008; Van Alstine and Neumayer 2008; Boyce 2008).[1] Economic growth is understood as a precondition for wellbeing, employment, and development (Bar et al. 2012), and as such, is viewed as the best approach for tackling both issues of poverty and environmental damage.

[1] The Environmental Kuznets curve has been widely criticized, arguing that the modeled declines in environmental damage mask a global "race to the bottoms" (Arrow et al. 1995; Stern, Common, and Barbier 1996; c.f., Ansuategi, Barbier, and Perrings 1998; Pearson 1998).

While many light green advocates recognize that socio-environmental sensitivity makes good business sense (Enresman and Okereke 2015), they tend to have uncomplicated understandings of both the environment and labor. According to light green proponents, correct pricing and valuation of natural resources, coupled with technological innovation, will drive economic growth while also preventing overconsumption of resources (Bar et al. 2011). Green jobs are simply viewed as a function of that growth (Bar et al. 2011). To be competitive in an increasingly global market, however, the emergent workforce needs a high degree of technical literacy (Gordon et al. 2012), and as such, many light green proponents are advocates of science, technology, engineering, and mathematics (STEM) education or Career and Technical Education (CTE) (Donovan et al. 2014; Gregson 2010). Although labor is recognized as an important input for production, there is little discussion about job quality, worker rights, equity, or the like.

Market justice is the backbone of light green economies. Unfettered markets, coupled with strong individual and corporate rights, are thought to produce the best technical innovations and long-term socio-environmental outcomes (Bhagwati 2004; Hollander 2003; c.f., Ehresman and Okereke 2015). The role of the government is minimal, relegated largely to protecting rights that ensure markets function freely. Government intervention beyond this role, particularly that advocated by moderate green proponents (i.e., discussed below), is viewed as green protectionism (UN 2011b). Progress is measured as gross domestic product (GDP). Given this perspective, light green advocates largely ignore the growth dilemma, and instead, tend to focus on good

corporate behavior, as exemplified in recent attention to "corporate social responsibility" commitments (Pop, Dina, and Martin 2011; Portney 2005).

The light green economy is the dominant paradigm and has the least transformative potential (Barry 2012; Brockington 2012; Ehresman and Oereke 2015; Evanoff 2011). As such, it is widely critiqued, as: "little more than the continued progression of corporate activities towards more corporate social responsibility and green jobs" (Ehresman and Oereke 2015: 16); the next oxymoron (Brand 2012b); a wolf in sheep clothing (Lander 2011); a cover-up for business as usual (Davies 2013), and much more (see Harcourt and Nelson 2015; Spash 2012; Wanner 2015). While light green proponents champion neoliberal economics, the socio-environmental harm wrought by nearly 40 years of neoliberal globalization is increasingly hard to refute, causing some to go as far as to claim free market fundamentalism is dead (Stiglitz 2008; c.f., Halle 2011; Wallerstein 2008).

Moderate green economies

Like light green proponents, moderate green economy advocates perceive a green transition as an economic and environmental win-win. As the U.N. Environmental Program (2011) states, "[T]he greening of economies need not be a drag on growth. On the contrary, the greening of economies has the potential to be a new engine of growth, a net generator of decent jobs, and a vital strategy to eliminate persistent poverty" (p. 16). Moderate green proponents, however, view a market-based approach as insufficient, arguing that without ample reform, a green transition is highly unlikely (Ehresman and Okereke 2015). Although criticizing light green supporters for neglecting the social dimension and underestimating the amount of change needed (Bar et al. 2011), moderate

green promoters argue that the best chance of success lies in finding solutions inside rather than outside the capitalist system, especially given the urgency of current socio-environmental crises (Ehresman and Okereke 2015; Halle 2011; Haas 2012; Newell and Paterson 2010; U.S. Organization for Economic Co-operation and Development [OECD] 2011).

Moderate green advocates tend to argue for selective and limited growth, recognizing the existence of environmental constraints, as well as that in a green transition, there will be winners and losers. Inherently brown industries will have to be phased out while green industries fostered (Bar et al. 2011; c.f., Rogers 2013). Moderate green proponents also recognize that "the transition to a green economy is likely to have regressive distributional effects- [and that] these hardships- especially for the least well-off members of society- need to be balanced and compensated for" (OECD 2011: 85). Aligned with the social democratic tradition, moderate green economies emphasize egalitarian justice, which addresses issues of inequality, human rights (Woods 2006), and inclusive development (Gorden et al. 2007; Jones 2009; Yen Liu and Keleher 2009).

Government intervention is viewed as especially important for overcoming market failures and guiding a just transition. Important interventions include, for example: regulating industrial pollution, especially among minority populations (Jones 2009); protecting labor rights and promoting high-road development (Jones 2009; Rogers 2006; White, Dresser, and Rogers 2012); limiting corporate power, especially that of the fossil fuel industry (Klein 2014; Koren [1995] 2015); managing carbon dioxide and other climate change emissions (Bumpus and Liverman 2009; While, Jonas, and Gibbs 2009); conserving natural resources and curbing consumption (Fuchs and Lorek 2005); and,

investing in climate preparedness and resiliency (Bierbaum et al. 2013; Juhola and Westerhoff 2010). Moderate green advocates insist such large-scale transitions like greening an entire economy require management and that no other actor is in a better position to exert power or influence than the state (Duit, Feindt, and Meadowcroft 2016; Mol and Buttel 2002).[2]

Labor and environmental coalitions, such as the BlueGreen (2016a) and Apollo Alliance (2016), are especially powerful promoters of the moderate green perspective. Despite an historic divide, particularly over the relative importance of socio-environmental issues in development processes, in the last decade or so, several members of the two groups have realized their collective interest in combating neoliberal pressures (Gould, Roberts, and Lewis 2003; Mayer 2009). Progressive leaders have seen through the "jobs vs. environment" conflict, advocating for socio-environmental reforms, such as the Kyoto Treaty, higher Corporate Average Fuel Economy (CAFE) standards (Greenhouse 2006), renewable energy production, and much more (BlueGreen Alliance 2016b).

Like the light green perspective, moderate greens have been heavily critiqued. According to Kosoy and colleagues (2012), the idea of the moderate green economy is

[2] The varied and historical roles taken on by the state make evident its wide potential impact. These include, for example: the welfare state (Epsing-Andersen 1990; Pierson and Castles 2006), the developmental state (Johnson 1982; Woo-Cumings 1999), the Schumpeterian competition state (Schumpeter 1934, 1942), the environmental state (Fisher and Freudenburge 2005; Goldman 2001; Mol and Buttel 2002), and, perhaps most recently, the hidden developmental state (Block 2008; Block and Keller 2011; c.f., Mazzucato 2014).

nothing more than a repackaging of "Keynesianism or neo-liberal austerity" (p.74, quoting Kallis 2011). Although viewing impending socio-environmental issues as more complex than light green proponents, deep green advocates (i.e., discussed below) often criticize moderates for failing to recognize the "limitations of the endless growth paradigm" (Ehrsman and Okereke 2015: 19). Furthermore, Davies and Mullin (2011) argue that interventions, such as the Green New Deal, are illusionary, because new green jobs will largely develop in the high-tech sector and hardly benefit "those on the margins of the mainstream economy" (p. 798). What Davies and Mullin (2011) rightly point out is that there is nothing inherently just about green jobs. As evident by blue-green coalitions (Apollo Alliance 2016; BlueGreen Alliance 2016a) and scholarly research (Brecher, Costello, and Smith 2007; White, Dresser, and Rogers 2012), creating green jobs that promote high-road development is political, that is a result of struggle for socio-environmental justice.

Deep green economies

The origin of the deep green economy conceptualization is rooted in the environmental movements of the 1960s and '70s when works such as Carson's (1962) *Silent Spring*, Ehrlich's (1968) *The Population Bomb*, and Meadows and Meadows' (1972) *Limits to Growth*, helped foster a new environmental consciousness by raising awareness of issues like toxic chemicals, overpopulation, and food security. Also at this time, the social democratic state, which had worked well during the high-growth years of the 1950s, began to break down, ushering in a fiscal crisis for several states (Harvey 2005). Out of this confluence of crises grew the concept of sustainable development,

which had the analytic advantage of addressing both environmental and economic concerns (Lamphere and Shefner 2015).

Inspired by demodernization and radical Marxist perspectives, the nascent concept of sustainability questioned the possibility of green capitalism (Lamphere and Shefner 2015). According to demodernization proponents (e.g., Commoner 1971; Naess 1973, 2005), extant socio-environmental problems made evident that further modernization and its techno-institutional fixes would fail to provide solutions (Mol and Spaargaren 2000). Radical Marxists (e.g., Bahro 1978, 1982; Roberts 1980; c.f., Foster, Clark, and York 2010; O'Connor 1996), although not questioning the process of modernization, honed in on the structural contradictions that they claimed rendered the capitalist system unsustainable. Schnaiberg (1980) in his influential treadmill of production theory, likened capitalism to running in place at increasingly accelerating rates while having to meet ever-growing demands with ever-depleting resources. Both radical Marxists and demodernization proponents advocated for revolutionary change, arguing that structural justice (i.e., that which alters the foundation of the global economy) is necessary to achieve sustainability.

For deep green economy advocates (e.g., Bowne and Fankhauser 2011; Davies and Mullin 2011), greening economies has the same transformative potential as these early understandings of sustainability. Like demodernization and radical Marxist proponents, deep green advocates argue for systemic change and decentralized localism, that is, the transition from global trade and centralized governance to local sovereignty. [3]

[3] This distinction bears resemblance to the debate on locally owned import substitution (LOIS) and there is no alternative (TINA). The TINA model was originally articulated by Thatcher to convey that success in

While some recognize the state as instrumental in guiding a deep green transition (Brockington 2012; Kallis 2011; Scheider et al. 2011), for most, the government's role is minimal, leaving socio-economic organization and justice to the design of local community members (see Pepper 1998). Deep green proponents are highly critical of light and moderate green advocates for their assumptions of growth and emphasis on GDP measures, and instead often promote de-growth and measures of wellbeing as indicators of progress.

Several critiques have been leveraged against arguments for deep green economy development. First, deep green proponents have yet to identify a clear de-growth strategy that would result in a just transition (Albo 2007; Bar, Jacob, and Werland 2012). Advocates tend to be critical of high-tech solutions like those supported by light green and some moderate proponents, but are less clear on how a non-technical transition could occur while ameliorating socio-environmental harm. Such debates bring up questions about the Earth's carrying capacity and limits to growth. Additionally, any just transition

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global competition is necessary for development (Hess 2009; Shuman 1998, 2007). According to TINA, if communities want to prosper, they need to attract and retain high-tech innovation companies for the production of exports, often by weakening labor and environmental regulations, as well as through direct investment or incentives, both of which cost taxpayers' money (Block and Keller 2011; Shuman 1998, 2007). LOIS, on the other hand, seeks to foster development by encouraging communities to substitute imported goods with those produced locally. The advantages of LOIS are well-documented: (a) local firms tend to have deeper connections (i.e., sense of place) with communities; (b) money spent at local institutions tends to circulate longer in the local economy, resulting in the multiplier effect; and, (c) while a TINA-dependent community is held hostage to its largest employers, a LOIS-based community is better able to shape local labor and environmental standards (Shuman 1998, 2007; c.f., Jacobs 1969; Schumacher 1999 [1973]).

will require financing, for which deep green advocates have no well-defined plan (Bar, Jacob, and Werland 2012). Both light and moderate green advocates emphasize, albeit differently, the importance of public-private funding. Deep green proponents, however, fail to specify how a de-growth economy dependent upon volunteer or non-profit organizations could finance a green transition, again, while minimizing socio-environmental harm. Lastly, does market-based localism pose a radical alternative to capitalism? According to Hahnel (2015), simply switching to worker-ownership or the like is subjected to the same market logic that wrought neoliberalism and will not necessarily engender the structural justice promoted in deep green arguments.

Some scholars claim that deep green perspectives, with their emphasis on radical change and structural justice, are largely concentrated in academia and absent from political discourse (Bar, Jacob, and Werland 2012; Ehresman and Okereke 2015). Hess (2003), however, argues that such early sustainability movements "did not undergo a decline and degeneration during the subsequent decades [but] rather underwent its own modernization process" (p. 20). Hess (2003, 2008) terms this modern sustainability movement as green localism, stating that it is alive, well, and evident in three basic types of organizations: households, locally owned for-profit and non-profit organizations, and publically owned agencies. Examples of such organizations include: family-owned businesses, community gardens, resale markets, cooperatives, community banks, B-Corporations, and publically owned utilities. Unlike light green proponents and many moderates, green localists are not solely defined by for-profit production, but instead emphasize self-sufficiency and resiliency at the local level (Torgerson 2001).

According to Curtis (2003), conventional economic theory, although cognizant of green localism, often lumps such activity under the broad category of informal or underground economics and either ignores or analyzes it "as a source of small scale commercial entrepreneurialism consistent with the usual maximizing principles and assumptions" (p. 86). Consistent with this view, the informalization of labor relations is often associated with the growth of neoliberal globalization and the precariat (see Standing 2011a, 2011b). Undeniably, the informal economy offers several advantages to at-risk employees (e.g., fewer barriers to access, economic remuneration, avoidance of burdensome regulations, etc.), especially for those with criminal records or of illegal status. However, to conceive of green localism as an illicit market is to short-change it. According to Hess (2003), green localism is under-examined and in need of more careful consideration "as a complementary strategy for job creation and economic development" (pg. 33-34), especially for regions not capable of developing into high-tech "global cities" (Sassen 2000).

Shades aside

Various conceptualizations aside, what we do know from the abundance of studies is that green jobs are growing faster and tend to pay better than traditional or brown economy jobs across skill levels. From 2010 to 2013, the U.S. Bureau of Labor Statistics (BLS 2013a) tracked green jobs, finding growth rates up to four times faster than all other industries combined.[4] The Brookings Institute found median wages in the green economy, that is those in middle of the distribution, 13 percent higher than the

[4] In 2013, budget sequestration cut the BLS's funding by $30 million or about five percent; two programs were eliminated, including the Green Jobs Initiative (BLS n.d.a).

median U.S. wage (Muro, Rothwell, and Saha 2011). Several others report similar benefits to green jobs (c.f., Pew Charitable Trusts 2009; Pollin et al. 2008; Pollin, Heintz, and Garrett-Peltier 2009; Yen Liu and Keleher 2009). For moderate green economy advocates, such studies underscore the importance of investment, especially federal investments like the American Recovery and Reinvestment Act (ARRA). While such arguments have been criticized for assumptions of growth, on the one hand, and as green protectionism on the other, these studies, many of which were conducted right after ARRA, showcase how investment in good green jobs can meaningfully impact U.S. workers.

Likewise, we know that green economies have the potential to widely impact industries and occupations. There exists no official list of associated industries and occupational categories, which in part, has contributed to its varied conceptions (Gorden et al. 2012). For those with lighter conceptualizations, the green economy is often reduced to energy industries, such as low-carbon transportation, energy efficiency, or clean technology (c.f., Muro, Rothwell, and Saha 2011). Rogers (2013), however, suggests that the green economy is best understood as the greening of the entire economy, as opposed to a dual labor market, distinct production processes or products, or separate production standards (c.f., Mattera 2009). For Rogers (2013), green economy development is a process whereby new green industries are fostered, inherently destructive industries are phased out, and remaining industries are transformed to meet greener standards. Note, however, that even within lighter conceptualizations, wide swaths of occupations, at varied skill-levels, are impacted. For example, jobs in energy conservation can range from the green-collar worker caulking windows to the high-tech

engineer developing lithium batteries. See Table A.2 for a depiction of select industries and associated occupations in the green economy.

Finally, we also know that green growth is coordinated growth. That is, markets alone do not green economies, and a just transition requires concerted and coordinated effort on behalf of stakeholders (Gorden et al. 2007; Jones 2009; Lamphere and Shefner 2016; Yen Liu and Keleher 2009). The potential benefits of multi-stakeholder partnerships abound: greater participation can beget diverse expertise and resources (Backstrand 2006); inclusive planning can address participation gaps (Haas 2004; Isham, Navayan, and Pritchett 1995; Isham, Kaufmann, and Pritchett 1997); decentralized structures often offer greater flexibility in implementation and adaption (Backstrand 2006); and overall, more effective problem solving is possible (Backstrand 2006; Dalal-Clayton and Bass 2002; Hemmati 2002). The successful coordination of diverse stakeholders, however, is no easy task. As indicated in several studies (Biermann et al. 2007; Cheyns 2011; Faysse 2006; Volkery et al. 2004), the potential pitfalls of such partnerships are numerous (e.g., uneven power, disorganization, lack of technical capacities or financing, etc.). While research on multi-stakeholder partnerships is still in its infancy (Biermann et al. 2007), findings suggest success depends on strong and able leadership, inclusion of and equity for varied institutions, consensus building and planning, as well as monitoring, learning, and adapting (Backstrand 2006; Volkery et al. 2004).

Conceptual Framework for "Green Economy"

Along with no conceptual agreement, there exists no framework for understanding the role of institutions and actors in guiding a green economy transition.

The purpose of this section is to illustrate the framework I developed to help conceptualize and operationalize "green economy." Taking the multilevel perspective (MLP) as my starting point (Geels 2002; Geels and Schot 2007; Rip and Kemp 1998), I incorporate insights from political economy, particularly Bock's (2008) and others' (Block and Keller 2011; Mazzucato 2014) work on the state, as well as socio-environmental theory, particularly Hess's (2003, 2007, 2009, 2012) work on sustainability pathways.

The multi-level perspective

The MLP belongs to a set of middle-range theories referred to as "Transition Theory," first developed in the early 2000s by a close-knit group of largely Dutch scholars (van der Bruggee 2009).[5] The MLP seeks to explain the evolution of socio-technical systems, which Geels (2004) describes as "a cluster of elements, including technology, regulations, user practices and markets, cultural meanings, infrastructure, maintenance networks and supply networks" (p. 3). According to the MLP, socio-technical systems are ordered, reproduced, and transformed by the diversity of actors and institutions operating within and between three levels: (1) niche-innovation, which is the locus for experimentation and radical novelties; (2) regime, which refers to social groups that interact, form networks, and set group rules (i.e., cognitive, regulative, and normative); and, (3) the landscape, which includes long-term patterns, such as culture,

[5] Transition theory is loosely used as an umbrella term for a collection of interrelated theories, which include the MLP (Geels 2002; Geels; 2005; Geels and Schort 2007), transition management (Kemp and Rotmans 2009; Loorbach and Rotmans 2010; Rotmans et al. 2000), strategic niche management (Elzen, Hoogma, and Kemp 2003; Grin et al. 2010), and most recently, the triple-embedded framework (Geels 2014). The MLP provides the broad theoretical framework on which subsequent theories are based.

demographics, macroeconomics, and the environment. Each level functions relatively autonomously. However, the landscape and regime collectively comprise the "selection environment," which refers to their co-construction of opportunities for niche-innovations to enter the regime level (Grin et al. 2010). According to Geels and Schot (2007), transitions occur:

> …through interactions between processes at these three levels: (a) niche-innovations build up internal momentum, through learning processes, price/performance improvements, and support from powerful groups; (b) changes at the landscape level create pressure on the regime; and, (c) destabilization of the regime creates windows of opportunities for niche-innovations. (p. 400)

According to Smith, Stirling, and Berkhout (2005), regime change is the function of two main processes: shifting selection pressures and the coordination of resources via the regime to adapt. Selection pressures can emerge from innovative niches, especially as their networks strengthen and innovations develop, as well as from the landscape. Van Driel and Schot (2005) delineate three types of landscapes: slow changes like environment or climate; long-term changes like neoliberal capitalism; and, rapid external shocks like war, which often cause disruption to the first two types. As pressures mount, at some point regime actors coordinate via an alignment of visions and actions (Geels and Schot 2007). Given selection pressures and the regime's ability, four transition pathways are possible: (1) if niche-innovations are not sufficiently developed and pressure from the landscape weak, regime actors will modify their path; (2) rapid landscape pressure can de-align the regime, and if niche-innovations are not sufficiently developed, they will proliferate until one emerges dominate; (3) if landscape pressure is rapid and niche-

innovators developed, they replace the regime; and, (4) if the two groups coordinate efforts, they reconfigure the basic regime structure (Geels and Schot 2007). The pathways, however, are not deterministic, and if there is no pressure, the extant structure will reproduce (Geels and Schot 2007). Table A.3 summarizes these pathways.

Transitions do not occur easily, because the selection environment is stabilized in many ways, causing path dependency or lock-in (Grin et al. 2010). Lock-in occurs when regime actors manipulate rules and resources to prevent niche-innovations from maturing or developing at all (i.e., lock-out, the worst kind of lock-in). Regime actors are reluctant to radically innovate for several reasons: they have investments in existing technologies and skills (Aurthur 1989; Unruh 2000; Walter 2000); innovations are risky and may disrupt existing patterns of power (Tushman and Anderson 1986); and, little incentives exist to internalize extant socio-environmental externalities (Geels 2014). Despite tendencies to protect the status quo, incumbent actors can and occasionally do provide financial and political support for niche-level innovation. Hess (2014), borrowing from Galbraith's (1952) concept of countervailing industrial power, refers to this as countervailing industry mobilization. Richard Branson's $25 million Virgin Earth Challenge and Elon Musk's open-source technologies are both examples of the increasing trend of wealthy individuals investing in technologies to accelerate a green transition (Klein 2014).

Figure A.1 presents a multilevel, embedded framework of the green economy as a socio-technical system.[6] The three levels are depicted on the left, with the landscape and

[6] Polanyi ([1944] 2001) first introduced the idea of "embeddedness" in reference to the economy as enmeshed with socio-political and cultural dynamics until the 19th century when there was a dis-embedding

niche shown with arrows symbolizing pressure on the regime. Following Elzen and colleagues (2011), I adopted an embedded approach (Dacin et al. 1999) for conceptualizing the regime. Policymakers, such as city planners and government leaders, and social movement actors, such as labor and faith-based groups, make up the "institutional environment," which provide regulatory and normative-cultural legitimacy to green economy activities. Production- based organizations, such as manufacturing, extractive, and construction industries, and consumption-based organizations, such as transportation, public utilities, and recycling and waste management organizations make up the "task environment," which generate supply and demand for green economy products and services. The major actors that comprise these environments are discussed in turn below.

Embedded stakeholder groups

I conceptualize stakeholder groups as a population of organizations and actors, which produce similar goods and services. As such, each stakeholder group shares similar interests and is subjected to similar pressures from niche-innovations and the landscape. Implicit in this term is a tension between isomorphism (DiMaggio and Powell 1983), that is, pressures towards similarities, and differentiation, that is, actions taken to outperform other organizations within the same stakeholder group.[7] Stakeholder groups were first

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of markets. Such dis-embeddedness is problematic, because it leaves society at the mercy of the market, which as evident by neoliberal capitalism, often falls short of providing life-sustaining needs. The environment has also increasingly been treated as a subset of the economy (i.e., instead of vice-versa). This too is problematic, largely because the economy is wholly dependent upon natural resources and its growth is far outpacing regenerative capacities (Daley and Farley 2010).

[7] This tension underscores the adaption-selection debate in organizational studies (see Geels 2014).

structured through a combination of the BLS's (n.d.b) and the Brooking's Institutes' (Muro, Rothwell, and Saha 2011) categorization scheme for green jobs. Those examined in this study include: agriculture, construction, education and workforce development, governance, research commercialization, transportation, and waste management. [8, 9]

Agriculture. Agriculture is at a crossroad. For over 50 years, the industry has been petro-dependent, relying on petroleum to fuel its machines, make its pesticides, and transport its products (Cable 2012). While the U.S. industrial mode of agriculture has been heralded as a success and its practices exported worldwide (Conway and Barbier 1998; Shiva 2016), external costs continue to mount (Union of Concerned Scientists n.d.). These include several major environmental problems like overgrazing, deforestation, desertification, water and air pollution, and toxic waste streams. Cable (2012) likens industrial agriculture, with its continual expansion, intensifying use of resources, and exacerbation of environmental impacts, to the treadmill of production. As problems and awareness continue to heighten, alternative and sustainable food movements are gaining popularity. U.S. cities are increasingly experiencing similar trends, including, for example: farm-to-table (Buck, Getz, and Guthman 1997) or Slow Food movements (Andrews 2008; Slow Food USA 2016); the proliferation of urban

[8] Governance is distinct from government. Governance refers to processes through which "collective goals are defined and pursued" not just by governments but also with and between "supranational and subnational state and non-state actors" (Betsill and Bulkeley 2006: 144).

[9] This is not an exhaustive list of stakeholder groups. Given the volume of institutions and actors present in any given economy, it is impractical in a single research project to focus on every possible stakeholder group. It made more sense to focus on those representing high-growth areas in U.S. cities of interest. Future research might examine other groups, including finance, media, medicine, manufacturing, and tourism.

farms and gardens (Lander 2011), growth in community-supported agriculture (Hess 2003; Mcllvine-Newsad, Merrett, and McLaughlin 2004); and, the expansion of farmer markets (Hess 2003). Often these movements are localist and have a strong justice-related focus, addressing issues like food access (Dubbeling, de Zeeuw, and van Veenhuizen 2010) and sovereignty (Alkon and Mares 2012; Schiavoni 2009).

Figure A.2 provides an illustration of major actors that comprise the agricultural stakeholder group. These actors, depicted in a commodity chain, connect input providers to consumers through an extension of relationships. In industrial agriculture, the typical commodity chain is linear, beginning with a multinational seed corporation (e.g., Monsanto or DuPont), and continuing through corporate farmers, processors, and retailers, to the consumer. In sustainable agriculture, the commodity chain is more variable. Farmers often are the seed-bearers, sell directly to retailers and consumers via food hubs or farmer markets, and contract with large processing corporations that have a green niche consumer base. Compared with sustainable agriculture, the industrial chain is heavily dependent on the performance of other participants. Pressure at any link renders the chain vulnerable, whereas dynamics in the sustainable agricultural chain offer more opportunities for resiliency.

Construction. U.S. buildings account for 73 percent of the nation's electricity use and 38 percent of carbon emissions (U.S. Green Buildings Council [USGBC] 2015a). Fortunately, green construction is on the rise. A third of the current industry is considered green (i.e., certified or qualified for any recognizable global green rating system), and within the next five years, projected to grow to one-half (McGraw Hill Construction 2013; USGBC 2015a). Such rapid growth can be explained by: rising standards and

awareness, which are driving demand for new construction (McGraw Hill Construction 2013); as well as, aging U.S. infrastructure, which is driving demand for weatherization (Joint Center for Housing Studies of Harvard University 2013). The diminishing costs of green building materials also contribute (Pearce 2014). Considerable gains in retrofits were made via ARRA, which allotted $5 billion in low-income assistance, $4.5 billion to retrofit federal buildings, $3.2 billion in energy efficiency and conservation block grants, and more (McGraw Hill Construction n.d.). In green certifications, Leadership in Energy and Environment Design (LEED) standards lead the market (Mattera 2009): nearly 175,000 professionals worldwide are LEED-certified, 85 percent of which believe their certification gives them a competitive edge; 34 U.S. states and over 450 local governments have adopted LEED-based policies; and, the USGBC (n.d.) estimates that LEED standards have generated over 250,000 jobs.

Figure A.3 provides an illustration of the actors that comprise the construction stakeholder group. Demand for materials and services, as well as the capital for such, often originate from the consumer (i.e., owners, buyers, or developers) and flows to the raw material providers. Codes and commissioners' demands, however, are often structured by government policy. Codes officials and commissioners regulate that policy, and through doing so, also structure consumer demand and the materials providers offer. Information, ranging from government-mandated standards, consumer preferences, and supplier availability, has several feedback loops, flowing within and between actors.

Education and Workforce Development. A skilled workforce is vital to a just green economy transition, but many U.S. workers lack the technical literacy needed to perform such jobs (Carnevale, Smith, and Strohl 2010; Gorden et al. 2012; c.f., American

Society for Training and Development 2012). Nearly 44 percent of U.S. workers have a high-school diploma or less, while 26 percent have some college and 30 percent a bachelor's degree or higher (U.S. Census Bureau 2010b). By 2018, 36 percent of jobs will require a high school diploma or less, while 30 percent will require post-secondary education and 30 percent at least a bachelor's degree (Carnevale, Smith, and Strohl 2010). Suggested strategies to address the skills-gap include: improve access to real-time job growth information, especially at local and regional levels (Reamer 2013); link curriculum and training with growth projections to provide concrete career paths (Yen Liu and Keleher 2009); offer diverse and flexible modes of earning credit (e.g., online or dual credit and enrollment options), as well as stackable certifications (Austin, Mellow, Rosin, and Seltzer 2012); and, strengthen relationships between industry and workforce developers (Doyle 2015).

Figure A.4 depicts the education and workforce development stakeholder group divided into five categories: (1) secondary education, which often includes STEM and magnet academies; (2) training centers, which offer adults employment services like occupational skills training and job search assistant; (3) community colleges, which not only provide employment services but also offer a flexible curriculum often able to adapt to local industry needs; (4) universities, which offer advanced education and skills training; and, (5) labor, particularly blue-green coalitions (i.e., labor and environmental organizational alliances), which are especially pertinent for green economies. Short of labor, these categories represent workers' levels of development. Secondary education provides career preparation for children as young as 14. Training centers service under and unemployed adults, and may also work at community colleges to connect workers

with additional resources. Universities provide advanced training. Labor, with its potential impact on workers' rights, wages, and benefits, impacts workers at all levels.

Governance. Many sustainability studies ignore how socio-environmental and economic processes at different levels and systems of governance interact (Bulkeley and Betsill 2005; Gibbs and Jonas 2000; Gleason and Low 2000; c.f. Hess 2014). In response to this deficiency, the concept of multilevel governance has recently garnered attention, particularly in the fields of STS, political economy, and critical geography (see Bulkeley and Betsill 2005; Harmes 2006). Multilevel governance describes the increasing diffusion of power and authority from the nation-state to the super- and sub-national state, as well as certain non-state actors (Harmes 2006; Hooghe and Marks 2003). More specifically, it provides a conceptual framework to understand vertical relations between city, state, national, and international governments, as well as horizontal relations between non-governmental actors like regional planning agencies (Corfee-Morlot et al. 2009). The vertical dimension acknowledges that nation-states cannot effectively manage a sustainability transition without cooperation at the state and local level. That is, power relations are embedded (Dietz, Ostrom, and Stern 2003; Hooghe and Marks 2003). The horizontal dimension, however, recognizes the increasing prevalence of governmental relationships within formal networks and coalitions, which work across organizational boundaries.

Figure A.5 portrays an illustration of the multilevel governance framework. The nation-state is centered at the origin, representing its organizational power over flows between local and international governances. Because, however, levels of government are embedded, nation-states not only enable but are also constrained by action at the supra-

and subnational level (Corfee-Morlot et al. 2009). At the supranational level, international stakeholder partnerships are often comprised of actors from the national level, governmental or not, and cooperate with international government actors. Occasionally, they also interact with those at the national or subnational level (e.g., ICEI Local Governments for Sustainability). Because cities are understood as the site where state, national, and supranational action materialize (Betsill and Bulkeley 2006), they play especially important roles in guiding transitions. As early as 1987, the Brundtland Commission's report, *Our Common Future*, identified this important role for cities (Daley, Sharp, and Bae 2013), predicating a surge in scholarship, examining, for example, sustainability definitions (Hempel 2009; Portney 2003), policy determinants (Bulkeley and Bestill 2005; Portney 2009; Zahran et al. 2008), and project outcomes (Budd et al. 2008; Rabe 2008). Despite this, little is known about why some cities green and others do not, as well as why governments that do differ in their prioritization of in-house and communitywide efforts (Daley, Sharp and Bae 2013).

Research commercialization. The research commercialization stakeholder group is the backbone of the green technopole. According to Hess (2003), green growth can be viewed on a continuum, ranging from green localism to the green technopole, which focuses on the high-tech potential of industry. Although light green economy advocates emphasize the role of private investment in the innovation process, Block and Keller (2011), as well as others (Etzkowitz and Leydesdorff 2000; Shinn 2002), document the declining centrality of large corporations and the increasing importance of the "triple helix" (i.e., university-government-private partnerships). The work of Block (2008) and others (Block and Keller 2011; Jenkings, Licht, and Haynes 2008) show that despite

neoliberal pressure on the state, government continues to be instrumental in the development of major innovations, including nearly all current general-use technologies (Mazzucato 2014). Block (2008) agues that neoliberal primacy has driven the "hidden development state" from view, causing it to largely operate without public knowledge or deliberation. Because of this, the state receives little credit for its large role in the innovation process, which actually serves the purposes of neoliberal, light green proponents.

Figure A.6 illustrates the actors in the research commercialization stakeholder group and their role in the innovation process, which consists of four phases. In phase one, federally- and state-funded labs typically perform basic and applied research, while industry-funded labs often join latter in the applied stage. Early funders, such as seed and angel investors, as well as venture capitalists, may finance early research and development, but often investments occur in phase two, product demonstration and scalability. During phase two, it is not uncommon for nonprofit licensing organizations, such as university- or lab-sponsored research foundations, a well as small business consultants, to help manage product demonstration and commercial rollout. Such organizations are instrumental in navigating the two largest problematic financing stages, known as the technological and commercialization valley of death (Muro, Rothwell, and Saha 2011). Following commercial rollout or sometimes directly prior, innovators select an exist strategy. Typical strategies include: government procurement, corporate acquisition or merger, public funding via equity markets, or private funding via an employee-management buyout or private equity.

Transportation. Given the United States' "car culture" and increasing hypermobility (Jakle and Sculle 2005; Rosenthal 2013), perhaps it is unsurprising that transportation accounts for 34 percent of greenhouse gas emissions (Preston 2010). The U.S. automobile dependency has been widely critiqued for encouraging driving and energy use, as well as contributing to climate change, air pollution, stormwater runoff, urban sprawl, social inequality, and other public health issues (Preston 2010; Thomas 2015; Tumlin 2012). In response, smart growth, that is "growth that expand[s] economic opportunity while protecting human health and the environment" (Environmental Protection Agency 2016), has gained popularity among scholars and practitioners (Knap and Talen 2005). More recently, within the umbrella of smart growth, several cities worldwide have adopted green transit-oriented development (TOD) Cervero and Sullivan 2011). With the goal of reducing vehicle kilometers traveled, as well as energy use via building infrastructure and community design, green TOD yields synergies between traditional TOD and green urbanism (Cervero and Sullicvan 2011). Specifically, both advocate for decreasing resource use and ecological footprint by building high-density and mixed-use communities, reducing surface parking and increasing impervious surfaces, and expanding alternative energy production and associated infrastructure (Cervero and Sullivan 2011).

Figure A.7 depicts the various roles of actors in the U.S. passenger transportation system. In private transportation, as well as public bus transportation, increasing CAFE standards are driving the use of more efficient and alternative-fuel vehicles (e.g., electric or hybrids). Several U.S. cities are also experiencing a growth in collaborative consumption and the rise of car- and parking-sharing businesses like Uber, Zipcar, Rover,

Park Circa, and more (see Stephany 2014). In addition to the share economy, walk- and bike-ability are garnering city attention, with importance placed on bike lanes, as well as green spaces like parks, trails, and greenways. Missing from this understanding of transportation is logistics or the movement of freight across commodity chains, which given the effect of neoliberal globalization and free trade (see Klein 2015; Schiller, Bruun, and Kenworthy 2010) warrants further attention, but is outside the scope of this study.

Waste management. In the United States, over 25 trillion pounds of waste are generated annually, amounting to over four pounds of trash per person per day (Seadon 2010). This is an aggregate 68 percent and 20 percent per capita increase since 1980 (Center for Sustainable Systems 2015). As overconsumption and associated waste continue to overload the Earth's assimilative capacity, sustainable waste management is increasingly garnering attention in scientific and public debates (Marchettini, Ridolfi, and Rustici 2007). Within these debates, Integrated Solid Waste Management (ISWM) models, defined as "collection, treatment, and disposal methods with the objective of achieving environmental benefits, economic optimization, and social acceptability" (McDougall 2001: 15), have emerged as preferred strategies. According to Morrissey and Browne (2004), there are three main ISWM models: (1) cost-benefit analyses, which assess impacts by translating them into monetary measures; (2) multi-criteria decision analyses, which are similar to cost-benefit analyses, but considers non-economic criteria like soil pollution; and, (3) life-cycle assessments (LCA), which study impacts throughout a product's life (i.e., "cradle-to-grave"). Although ISWM models continue to improve, all three tend to focus on economic and environmental outcomes and fail to

problematize the social dimension beyond the disproportionate location of waste sites in poor and minority communities (Morrissey and Browne 2004).

Figure A.8 illustrates waste management actors and their role in the ISWM system. Although municipalities are entrusted with waste management services, they rely on an array of actors to effectively implement sustainable ISWM. In the reduction phase, the most preferred waste management strategy, the scientific community is increasingly playing a large role in developing technologies and tools to reduce waste at the source (e.g., improved LCA or multi-criteria models). This is also true in the waste-to-energy phase, where innovators are developing emergent technologies to convert waste into useable forms of energy (e.g., gasification or methane recovery systems). In the first three phases, public participation is especially important, because without it, source reduction and segregation is severely thwarted (Joseph 2006; c.f., Marchettini, Ridolfi, and Rustici 2007). Across all phases, the role of private industry is salient, and depending on the municipality, may be contracted for the collection, transport, processing, and disposal of waste (Joseph 2006).

Conclusion: Conceptual Limitations

Because the green economy conceptualization depicted in Figure A.1 is heavily based on the MLP and associated research (e.g., Geels 2002; Geels and Schot 2007; Rip and Kemp 1998), it suffers from similar limitations. First, the model struggles to problematize power within and between regime and niche actors. To help address this limitation, I incorporate insights from Block (2008) and others' (Block and Keller 2011; Mazzucato 2014) work on the state, which demonstrates the important role of government in the innovation process. I also draw from Hess's (2003, 2007, 2009, 2012)

research on alternative sustainability pathways, which not only provides for a more nuanced understanding of growth patterns but also the role and relative power of particular institutions and actors in guiding varied trajectories. Hess's work also helps address the model's second major limitation, which is its emphasis on technological innovation at the expense of the social (see Geels 2005; Kemp, Loorbach, and Rotmans 2007).

With its STS-origin, it makes sense that the MLP was developed to explain techno- and product-oriented change and has difficultly accounting for the emphasis on self-sufficiency and resiliency, for example, in green localism. This deficiency, however, has recently prompted scholars to glean insights from social movement studies to better understand how mobilized publics impact green transitions (e.g., Dahle 2007; Elzen et al. 2011; Hess 2010, 2012, 2015).[10] Hess's (2003, 2010) work on alternative pathways is especially instructive. Expanding his research on green localism, Hess (2010) identified four different roles grassroots efforts play in generating the political will behind regime change: (1) industrial opposition movements, which aim to develop a moratorium on products or processes; (2) access movements, which demand greater access to goods or reduced exposure to pollutants; (3) alternative industrial movements, which focus on designing and diffusing alternative products or processes; and, (4) democratic movements, which address issues of deliberation, participation, and ownership. Adding

[10] Given similarities between the MLP and political process theory (PPT), in particular, this approach has much promise. Both draw from process theory, theorize on elite change, are concerned with multilevel (in)stability, and place importance on strategic partners. Additionally, the MLP's discussion of selection pressures bears semblance to that of the PPT's political opportunity structure.

these alternative pathways to Geels and Schot's (2007) typology depicted in Table A.3 provides for a much fuller understanding of the variability in green transitions.

Problematizing power within and between regime and niche actors is also crucial. At the regime-level, actors and associated institutions have the ability to stabilize socio-technical systems by aligning views and priorities, as well as to destabilize systems by creating misalignment and tension (Lawhon and Murphy 2011). At the niche-level, actors put pressure on the regime and, along with the landscape, create the impetus for transitions. Following Grin and colleagues' (2011) suggestion to incorporate insights from political economy, I explore the dynamic links between actors and institutions to identify their strength and role in guiding a green economy transition (c.f., Freeman 1995; Lundvall 1992; Mazzucuto 2014; Nelson and Winters 1982). In particular, Block (2008) and other's (Block and Keller 2011; Mazzucato 2014) research on the state, as well as Hess's (2003) on the green technopole, illustrates the often hidden role of government in the innovation process. Hess's work on alternative sustainability pathways also aids in problematizing power relations by elaborating on the role of social movement actors in guiding the trajectory of a particular transition.

Overall, the conceptualization of the green economy, as depicted in Figure A.1, allows an operationalization of the MLP that enables questions to be addressed, such as: What are the fundamental institutions and actors engaged in diverse green economies? How do growth patterns impact the larger community? What are the resultant development pathways? In particular, the unpacking of the embedded stakeholders allows for a comparative analysis of the networks of institutions and actors active within varied green economies, and Hess's (2003, 2007, 2009, 2012) research on alternative

sustainability pathways aids in understanding variation within green growth patterns. Chapters 4 and 5, which discuss my in-depth case study and comparative analysis respectively, demonstrate the usefulness of these contributions in understanding the strength, role, and impact of actors and institutions in varied green economy transition pathways.

Chapter 3: Methodology

Taking U.S. cities as the unit of analysis, I examined four locations recognized for their vibrant greening economy: Austin, TX; Chicago, IL; Knoxville, TN; and, Little Rock, AR (see Muro, Rothwell, and Saha 2011). Drawing on four years of fieldwork experience, over 60 semi-structured interviews, 15 focus group discussions, and extensive archival and survey research, I examine the strengths, roles, and socio-environmental justice-related impacts of green economy institutions and actors. The Institutional Review Board letter approving this research is reproduced in Appendix A. I elaborate on my case selection, research questions, methods, and analysis below.

Case Selection

As mentioned in Chapter 1, cases were selected for pragmatic and theoretical reasons. I reside in Knoxville, which greatly eased data access issues. For this reason, coupled with its impressive green growth, Knoxville is my in-depth case study. In selecting comparable cases, it was important to have variation in both circumstances and outcomes (see King, Keohane, and Verba 1994; Rohlfing 2012). Concerning circumstances, Chicago was selected as the primary contrast, because it provided a diverse case, greatly differing with Knoxville in terms of size, socio-political culture, geographic region, and more. Austin and Little Rock were selected as secondary contrasts, differing less along the same criteria. Although all four cases have high-growth green economies, a quick look at outcomes shows key differences. For example, Knoxville and Little Rock both have annual growth rates above 10 percent, but whereas Little Rock's jobs tend to be green-collared (72.1 percent) and industry clustered (13.2 percent), only 37.7 percent of Knoxville's jobs are green-collared and 2.6 percent of its

industry clustered (Muro, Rothwell, and Saha 2011). Both Chicago and Austin have growth rates closer to five percent and offer mostly green collared-jobs (70.1 and 65.3 percent, respective). However, Austin lacks clusters (1.2 percent) and Chicago's green industry is highly concentrated (28.3%) particularly in energy (Muro, Rothwell, and Saha 2011). Chapter 5 offers a more detailed comparison of the four cases.

Research Questions & Propositions

Question 1: What are the fundamental characteristics shared among the green economies, and what distinguishes them?

> Proposition 1: Green economies share similar pressures from niche-innovators and the landscape, although effects are more variable at the local level.
>
> Proposition 2: Green economies share similar configurations of regime and niche actors, although they differ by power.

Question 2: How do the green economies' development pathways differ, and in what ways are they similar?

> Proposition 3: Development pathways vary according to their landscape, regime, and niche configurations.
>
> Proposition 4: Development pathways vary according to socio-environmental justice-related goals prioritized in projects within and between regime and niche actors.

Research Methods

Archival research

I conducted archival research on all four cases. The purpose of the archival research was to provide broad coverage of and precise details on green economy

processes, including landscape, regime, and niche characteristics, as well as events over time. All materials examined were publically available or made available to the University of Tennessee (UT) researchers. I began data collection with keyword searches in each city's major newspaper: The Austin American-Statesman, Chicago Tribune, The Knoxville News Sentinel, and Arkansas Democratic Gazette. Keyword searchers were performed in the America News Bank (2016) database and included base words and derivatives (e.g., a search on energy would also yield a search on clean energy, energy efficiency, renewable energy, etc.). Articles pertaining to the green economy and published between January of 2010 and November of 2015 were included in the analysis.[11] See Appendix B for a list of the keywords used in the searches and the corresponding percent of articles included in the analysis. I then snowballed, examining and including select documents referenced in the newspaper articles. See Table A.4 for a depiction of the documents collected for each stakeholder group by case.

Interviews

For Chicago and Knoxville, I conducted semi-structured interviews with green economy leaders. [12] The purpose of the interviews was to understand green growth from the participants' perspectives. My sample includes 57 interviews in Knoxville and eight in Chicago. To identify the Knoxville interviewees, I first constructed a database of area

[11] Several word searches, especially those for common terms like "green" or "advanced," yielded articles irrelevant to the green economy. Based on the criteria of face validity, I selected which articles to include in the analysis. Also, only news articles were included. This excluded, for example: cartoons, photographs, advertisements, obituaries, editorials, and classifieds.

[12] A team of UT researchers conducted the Knoxville interviews. I conducted or participated in 75.44 percent. I conducted the Chicago interviews.

green economy leaders. To begin, I obtained a copy of the 169 Knoxville organizations included in the Brookings Institute's study of regional U.S. green economies (see Muro, Rothwell, and Saha 2011). Using a similar methodology (i.e., sorting through local records like phonebooks and list-serves), I added to their list, yielding a database of nearly 300 organizations. Contact information for leaders within each organization was obtained using publically available records. I relied on website searches to identify the Chicago interviewees. The Knoxville interviews were conducted between September of 2014 and October of 2015. The Chicago interviews were conducted in August of 2015. Leaders (e.g. mangers, owners, corporate executive officers, and directors), especially in Chicago, were carefully selected to represent the diversity of actors within and across stakeholder groups. Table A.5 depicts the characteristics of the participants by stakeholder group and case.[13] Across cases, sex was evenly split (i.e., 50.0 and 43.9 percent male in Chicago and Knoxville, respectively), most participants were white (i.e., 85.0 percent in Chicago and 93.0 percent in Knoxville), and the average age was in the mid-40s (i.e., 42.2 years in Chicago and 44.4 years in Knoxville).

The interviews were guided by an interview protocol, reproduced in Appendix C. The protocol was slightly modified according to the participant's position in the green economy or by specific and relevant programs or initiatives performed by the participant or respective organization. Throughout the interviews, participants were encouraged to "speak freely in their own terms" and discuss issues not specified in the protocol (Lofland

[13] Because governance contains government and non-government employees (e.g., those working in planning commissions or Chambers of Commerce), the stakeholder group was oversampled. Oversampling was also justified by my theoretical interest in Block (2008) and others (Block and Keller 2011; Mazzucato 2014) research on the state and its "hidden" role in the innovation process.

et al. 2006: 105). The interviews were audio-recorded and later transcribed. Directly following each interview, field notes were written to record the setting, interruptions, and information about the participant (i.e., job title, age, sex, disposition, and level of comfort and rapport during the interview). Over half (i.e., 55.6 percent) of the audio-recordings were transcribed via GMR Transcription (2016), a nationally recognized transcription service provider. The remainder, I transcribed. The interviews ranged from 31 minutes to 2 hours, with the average lasting 64 minutes.

Fieldwork

For Knoxville, I conducted over four years of fieldwork, working with and within a variety of institutions critical to the area's green economy. Since it's founding in 2011, I worked as the graduate research assistant for the University of Tennessee's Green Economy Initiative (UTGI). Established as a public-private partnership initiative, UTGI promotes research on and engagement with the Knoxville area's green economy. My work has included, for example: developing and managing a database of local green economy actors (i.e., as described above); conducting focus group research as part of the City of Knoxville's IBM Smarter Cities Challenge program; co-organizing Knoxville's first and second forum on greening the area's economy; and, presenting work at organizing and trade events. UTGI provided diverse data collection and engagement opportunities, affording me several opportunities to work with actors from each stakeholder group.

I also conducted field research at several green economy-related events, such as regional conferences, trade shows, seminars, green award ceremonies, Green Drinks gatherings, and community development meetings. All events were open to the public or

UT researchers. My work for UTGI was often conducted in the tradition of public sociology. One of UTGI's (2016) central goals was, and continues to be, to organize interactions among and collaborations between the breadth of area green economy actors (c.f., Shefner 2015). Because actors both within and across stakeholder groups often have varied motives and goals, especially in Knoxville where green growth is largely segregated (i.e., see Chapter 4), facilitating collaboration poised several challenges. Described as "herding green cats," UTGI has sought to bridge divides through networking events and information sharing (Medley, Shefner, and Lamphere 2016). In addition to the work of public sociology, this research was also conducted in the tradition of participant observation and focused on the complex ways individuals experience and negotiate the diversity of circumstances surrounding green economy development (see Fetterman 2010). Within 24 hours of all fieldwork, "thick description" (Geertz 1973) field notes were written, providing context-specific accounts of all events that occurred while on site. Throughout the field research, memoranda were written to aid in synthesizing data, helping to reveal themes and gauge progress (see Emerson 2001; Fetterman 2010).

Focus groups. For Knoxville, I also analyzed 15 focus group discussions.[14] Eleven discussions were held at Knoxville's 2103 *Let's Grow the Knoxville Area's Green Economy* forum, which was hosted by UTGI, the City of Knoxville, and others, and was well attended by nearly 100 representatives from industry, business, government, and

[14] Some focus group participants also participated in the interview and/or survey research. Likewise, some interviewees were also survey respondents.

more.[15] The purpose of the forum was to introduce actors, who worked in similar fields and yet did not know each other, to build networks and identify bridges and barriers to growing the area's green economy. Participants each partook in two discussions, a morning and afternoon session. Each discussion was staffed with an experienced facilitator and a recorder, both of which were briefed prior to the event. Facilitators were provided with a focus group protocol, which is reproduced in Appendix D.[16] The recorders, all of whom were graduate students from the UT Sociology Department, later transcribed their respective group's discussion. Forum results were presented in a report that was made available to the public (see Shefner, Lamphere, and Jones 2013).

In March of 2015, UTGI convened an additional focus group. The purpose of the discussion was to address workforce development concerns, a top priority in Knoxville area (see Plan East Tennessee [PlanET] 2012, 2013; Shefner, Lamphere, and Jones 2013). The group included six participants, who represented local community colleges and training centers. Dr. Jon Shefner, director of UTGI, facilitated the discussion using the interview protocol reproduced in Appendix C. I recorded and later transcribed the discussion.

The remaining three focus group discussions were conducted as part of the City of Knoxville's IBM Smarter Cities Challenge program, the purpose of which was to identify

[15] Sponsors included: the City of Knoxville, Knoxville Chamber of Commerce, UT Bredesen Center for Interdisciplinary Research and Graduate Education, UT College of Arts and Sciences, UT College of Business Administration, UTGI, UT Institute of Agriculture, UT Office of Research, and UT Provost's Office. For more information on the forum visit UTGI's website at www.greeneconomy.utk.edu.

[16] The focus group protocol was created prior to and provided the basis for the interview protocol, which accounts for their similarity.

strategies to reduce energy consumption in low-income homes. The discussions were conducted in late March and early April of 2015, one of which was held at a church and the others at a public agency. All were located in low-income neighborhoods. Dr. Jon Shefner facilitated the discussion using the focus group protocol UTGI designed, which is reproduced in Appendix E. I recorded and later transcribed the discussions. At the end of each discussion, participants were asked to complete a short questionnaire, also designed by UTGI, on household energy behavior. The questionnaire is reproduced in Appendix F. Table A.6 presents descriptive statistics for the three groups combined. The results of the focus group and questionnaire were reported back to the City. As in most qualitative research, opportunities to observe communities and community members emerged as part of other stricter methodologies. For example, the first Forum, as well as the focus groups, provided lots of opportunities to observe emerging relationships above and beyond the more controlled focus group settings.

Survey research. Also for Knoxville, I administered a survey to the area's green economy leaders. Like the interviewees, leaders were defined as those heading or leading organizations of interest. I used the database I constructed to identify interviewees to identify target recipients, which yielded a sampling frame of 288 green economy actors. Every actor in the sampling frame was sampled. The questionnaire was administered in two waves. The first was a paper-and-pencil questionnaire administered at Knoxville's second community forum on growing the area's green economy, which was held in October of 2015. The questionnaire is reproduced in Appendix G, and the responses per question are depicted in Appendix H. Like the first, the second forum was hosted by UTGI, the City of Knoxville, and others but focused less on identifying bridges and

barriers and more on developing an action plan.[17] The forum was well attended by nearly 70 representatives from industry, business, government, and more. Of those, 49 participants completed and returned the questionnaire.

Approximately 12 weeks later, I administered a second wave of online questionnaires using Qualtrics Research Suite. The same questions included in the paper-and-pencil questionnaire were included in the online version. Each recipient received a personalized email, reproduced in Appendix I, which provided basic information about the study and a link to access it. One week later, a reminder email, reproduced in Appendix J, was delivered to encourage participation from those yet to complete the questionnaire. The reminder gave recipients one week to respond and included the same basic information included in the previous email. Of the 288 target recipients, 39 had email addresses that were returned undelivered. Of the 249 recipients that received the invitation, 97 returned the questionnaire, 77 percent of which were fully completed. The response rate for the online survey is 38.96 percent. Data from the 49 paper-and-pencil questionnaires were added to the online data, yielding an overall return rate of 48.99 percent. Table A.7 provides the combined descriptive statistics for the two waves of participants.

Data Analysis

Data analysis proceeded at several stages. Analysis began on the with-in case level. The intra-case analysis allowed for a comprehensive understanding of the specific

[17] Sponsors include: the City of Knoxville, East Tennessee Quality Growth, UT Bredesen Center for Interdisciplinary Research and Graduate Education, UTGI, UT Institute of Agriculture, UT Office of Research, and UT Provost's Office. For more information on the forum visit UTGI's website at www.greeneconomy.utk.edu.

combination of circumstances that produced the green economy being examined. Once the within-case analyses were complete, I conducted a cross-case analysis by comparing the findings to determine if they were consistent across the cases (see Gagnon 2009). Overall, the goal was to "allow for systemic cross-case comparisons, while at the same time giving justice to the within-case complexity" (Rihoux and Ragin 2009: xviii).

In order to analyze the qualitative data, archival materials were converted to a portable document format (i.e., .pdf) and uploaded into QDA Miner. Interviews, field notes, and memoranda were transcribed and also uploaded into QDA Miner. I conducted two rounds of coding. The first round of coding was conducted using an open coding scheme. Careful attention was paid to key analytic variables. The second phase of coding entailed pattern coding, in which "meta-codes" were constructed to identify emergent themes, configurations, and explanations (Miles and Huberman 1994; Saldana 2013). See Appendix K for a final list of codes.

In order to analyze the quantitative data, data were exported from the Qualtrics Research Suite into an SPSS file (i.e., .sav). To ensure a successful export, all variables, including values and labels, were crosschecked with original documents. All missing data was assigned the value "99," and a value of "88" was assigned for valid "don't know" responses. Responses for missing data were generated using multiple imputation. Open-ended questions were assigned a value after data was collected and codes were developed.

Chapter 4: Knoxville, TN

"My belief is that ultimately, we should be fearless leaders, but we shouldn't be reckless. We should be strategic. Strategy is the key thing. Talk about it, use the bully pulpit, educate, and then strategically figure out where you can move and what power you have to do certain things." (Knoxville Government Leader)

In this chapter, I unpack the history of Knoxville's green economy development, illustrating how landscape pressures and the opening of political opportunities at the federal level enabled progressive leaders to fund some of the area's first green projects. I begin by unpacking Knoxville's landscape, exploring key characteristics (i.e., culture, macroeconomics, demographics, and environment) and concluding that conservative politics render the local landscape relatively closed. I then provide an historical narrative, detailing the actors and institutions that are driving the area's green growth. I divide the narrative into four time periods, each signifying a shift in the configuration of landscape, regime, and niche-innovators. Overall, the narrative demonstrates how progressive leaders were able to capitalize on federal investments and later leverage those investments to garner additional support to keep its green wave moving. The chapter concludes by summarizing Knoxville's green growth and discussing its theoretical implications.

Knoxville's Landscape

Nestled halfway between the Great Smoky Mountains National Park and the Cumberland Plateau, the Knoxville area is known as "The Valley" (Knoxville 2015). The Valley is a sub-range of the Appalachian Mountains characterized by sharp ridges and

deep basins. The area boasts over 200 days of sunshine, an average rainfall of 45 inches, and a 165-day growing season (Innovation Valley 2013a; Slayer 2015). The Tennessee River cuts through the City's downtown, creating a vibrant outdoor space for recreation and water sports. The City also hosts 81 parks, for a total of 1,854 acres (City of Knoxville 2016a), as well as 86 miles of paved greenways and natural trails (City of Knoxville 2016b). Additionally, Knoxville is home to the Urban Wilderness, which spans 1,000-forested acres across two neighboring counties and includes nearly 50 miles of multiuse trails, 10 parks, and four civil war sites, all of which are accessible less than three miles from downtown (see Legacy Parks 2016).

In 2015, the Huffington Post named Knoxville one of "The 10 Best Cities to Relocate in the U.S.," and Forbes identified it as the United State's second "Most Affordable City" (City of Knoxville 2016c). According to the Cost of Living Index, across basic expenditures, Knoxville is about 14 percent cheaper than the national average (Innovation Valley 2015). There is no state tax and the median cost of a house is $116,500, nearly one-third less than the national median (U.S. Census Bureau [USCB] 2010c, 2010d). The area is a strong attraction for retirees, drawn by its affordability and natural amenities (Allan 2015), as well as for millennials, attracted by the educational resources offered by the University of Tennessee (UT) and Oak Ridge National Lab (ORNL). Of the City's 178,874 residents, most are white (76.1 percent), and although educational attainment is on par with national averages, nearly a quarter (24.6 percent) live in persistent poverty, which is 10 percent higher than the national average (USBC 2010c, 2010d). In comparison to the larger Knox County, estimates improve slightly with only 17 percent of residents living in persistent poverty (USCB 2010e).

The Valley's low-wage, low-tax landscape is attractive to business. The area also offers several incentives, including a PILOT (payment in lieu of taxes) tax freeze, infrastructure development and site preparation work, local training grants, and land price discounts for select businesses (Innovation Valley 2013b). This is in addition to the State, which also sells itself as a "business-friendly environment," boasting the second lowest state and local taxes paid per capita in the United States and priding itself as a right-to-work state (see Tennessee Department of Economic and Community Development 2016). Additionally, the Tennessee Valley Authority (TVA), headquartered in Knoxville, provides cheap and reliable energy, as well as incentives like grants and low-interest loans to select businesses in its service area (Innovation Valley 2013c). This cocktail of incentives seems to be working. According to Innovation Valley (2016), a regional economic development partnership managed by the Knoxville Chamber of Commerce (KCC), last year alone, the area experienced 10 industry expansions and eight new recruits, adding 3,117 jobs and $1.3 billion in capital investments. Much of this growth has been in advanced manufacturing, particularly automotive, but considerable gains were also made in hospitality, transportation, and health care (William III 2015a).

However successful, the Valley's business-friendly growth strategy comes at an expense. As one interviewee working for the City put:

> We did this regional economic development study, and at that time [1980s], all the leaders, and all of the approach was, we are a low-wage town. Sell us as a low-wage town. We don't' want any of those damn unions here. That was the- we don't want anything like that here. We don't want any good paying jobs. We sell ourselves… Blount County Chamber of Commerce [adjacent to Knox] still had these little business cards that had the dog patch like from Li'l Abner, like a Dog Patch little symbol… So, we kind of sold ourselves as

> Dog Patch USA. That was the name of the town they lived in Li'l Abner. And it's the whole bad version of the southern story.

Undeniably, the low-wage, low-tax landscape impacted Knoxville workers, whose median household income is 37 percent lower than the national average (USCB 2010c, 2010d). However, it has also impacted local government, whose budget seldom allows for expenditures outside day-to-day operations. This has especially hurt public schools. According to Knox County School Board member Doug Harris (2014), the area's schools are vastly underfunded, amounting to $200 less per student than the state average, whose expenses rank in the bottom 10 nationwide. Students are also underperforming, with recent ACT scores indicating only 21 percent are college-ready (Harris 2014). One interviewee explained it like this:

> What I tell everybody is, you can't build- the Chamber and a lot of folks talk about having a great school system- you can't build a great school system on the backs of low-wage workers… because you don't have the tax-base… You're shooting yourself in the foot on that.

Progressive government action is also curtailed by the area's socio-political culture (Wheeler 2005). Located in south central Appalachia, Knoxville is in the heart of conservative coal country (Beauchamp 2013). Knoxville was never a mining town, but its early industrial growth was fueled by coal and factories staffed by residents from the surrounding counties. Many of Knoxville's current residents, particularly those in the County, have retained much of their cultural heritage. Often referred to as "mountaineers," south central Appalachians are known for their folk and mining culture: bluegrass music, arts and crafts, moonshine, and folklore icons like the Hatfields and McCoys (Gaventa 1984). They are also known for their history of exploitation and

poverty, as well as the traditions of resiliency, religiosity, and kinship that evolved out of those experiences (Appalachia Community Fund 2014; Gaventa 1984). Also because of their history, many Appalachians are averse to institutions, foreigners, and long-term planning (Beaver 1988). Perhaps not surprisingly, Knox County residents, as well as those in the surrounding metropolitan area, tend to vote Republican (Beauchamp 2013).

Amidst such a historically depressed region, it may be surprising that Knoxville has the fastest growing and second largest per capita green economy in the nation (Muro, Rothwell, and Saha 2011). With an annual growth rate of 14.6 percent, Knoxville has over 16,000 green jobs, which comprise 4.9 percent of its total economy (Muro, Rothwell, and Saha 2011). These jobs also pay an average wage of $45,188 annually (Muro, Rothwell, and Saha 2011), which is significantly more than the City's average per capita income of $23,177 (USCB 2010c). Additionally, over a third of survey respondents report a household income of over $125,000 per year. Given Knoxville's conservative landscape and seemingly closed political opportunities, such high-wage green growth is somewhat unexpected. Reflecting the report's findings, one interviewee who works for the City stated, "they [Brookings Institute] came out with this giant surprise, and we all tried to figure out why."

The rest of this chapter unpacks the history of Knoxville's green economy not only to answer the question of why but also how. As detailed below, the 2008 global financial crises and resultant stimulus funds opened up political opportunities at the federal level, which enabled progressive City leaders to fund several of its first green projects. The area's major federal and quasi-government institutions, known as the "ORNL-UT-TVA nexus" also capitalized on the changing landscape, flooding the area with American

Reinvestment and Recovery Act (ARRA) money and fueling local business. Although the City occasionally partnered with the ORNL-UT-TVA nexus, the story of Knoxville's green growth is largely bifurcated. The high-wage green jobs growth reported in the Brooking's study is largely attributable to the high-tech research within and between the nexus. The City's work, however, while not often resulting in secure, high-paying jobs, was successful in building several multi-stakeholder partnerships that strategically carried out municipal and public greening initiatives. Despite its divergent growth, Knoxville's green economy makes evident that federal investments, such as ARRA, can have a big impact at a local level, even one with a highly conservative landscape. A timeline of Knoxville's green growth is depicted in Appendix M.

Starting the Green Wave: 2007-08

For those that know the history of Knoxville's green growth, most attribute its start to the early work of Madeline Rogero, now current-Mayor of the City of Knoxville, and Madeleine Weil Klein, a former City employee. In 2007, Rogero was serving as the Director of Community Development under then-Mayor and current-Governor, Bill Haslam.[18] Rogero had competed against Haslam for Mayor in the 2002 election, running on a platform of sustainability, a topic to which Haslam was largely indifferent. Having lost, Rogero said, "I felt like I needed to support him, so we immediately started communicating and getting along and all, that was three years before he asked me to join his administration" (Beauchamp 2013). Klein, on the other hand, had recently moved to

[18] Also important to note, Bill Haslam, is the son of "Big Jim" Haslam, founder of Pilot Oil. According to Beauchamp (2013), "Bill, Big Jim, and Bill's older Brother Jimmy filled the top roles at Pilot and had used their wealth to become key players in the state's political and philanthropic scenes… [He goes as far to suggest,] think of them as something like less established versions of the Bush family."

Knoxville for her husband's new job, having worked previously for the City of New Haven on sustainability issues (Beauchamp 2013). Klein was hired as Deputy Director of Policy and Communications, where she met Rogero, and they started working together on several of the City's first green projects.

First, Rogero and Klein partnered with the Southern Alliance for Clean Energy (SACE 2013), a regional nonprofit advocacy group, and applied for a Department of Energy (DOE) Solar American City designation. The purpose of the DOE's (see 2012) program was to accelerate the adoption of solar energy technologies by collaboratively identifying and developing solutions to local barriers. Knoxville won and in 2008 became one of twelve DOE Solar American City partners. Along with the designation came a $200,000 award, $100,000 in matching funds from TVA, and $200,000 in technical assistance from DOE laboratories (Solar Outreach Partnership 2014). Included was funding for the City's first sustainability coordinator, Erin Burns Gill, current Director of the City's Sustainability Office. Haslam lauded their success, stating, "The City of Knoxville is, in a lot of ways, starting from scratch in terms of solar infrastructure, but because of our selection as a Solar American City, and the expert help that comes with that honor, we're off to a great start" (City of Knoxville 2008).

Also at this time, the City was incurring high energy bills, costing roughly $7.9 million or 4.3 percent of its annual budget (Burns, Fritts, and Weil 2009). Reducing costs became a priority, which Rogero and Klein seized as an opportunity to weatherize the City's municipal buildings (Beauchamp 2013). They pitched the idea to Haslam, selling him on the high return on investment. In response, Haslam established the City's first Energy and Sustainability Taskforce, which consisted of volunteers who initially focused

on auditing energy-use for all City-owned buildings (Hickman 2007). The taskforce put out a request for proposals, and in 2008 hired Ameresco, a leading provider in energy management, to audit its buildings and propose cost-effective upgrades (Beauchamp 2013; Burns, Fritts, and Weil 2009). Ameresco (2009) developed an aggressive plan that entailed retrofitting 99 city-owned buildings, 37 athletic fields, and three golf courses, the cost of which were to be paid by $19 million in savings over the next 15 years (Ameresco 2009).

"But it's not going to be limited to that," stressed Klein at the time, who was also the taskforce's co-chairwoman, along with Rogero (Hickman 2007). In New Haven, Klein had seen benefits from setting up a similar taskforce that worked to reduce energy consumption while also improving the quality and competitiveness of the community (Beauchamp 2013). According to Klein, with members from TVA, ORNL, the U.S. Green Building Council (USGBC), and more, the taskforce had "some of the best experts on energy efficiency in the country" and should "aim big" (Hickman 2007).[19] Haslam was onboard, later being quoted as stating, "two of our key goals when we started this process were to develop realistic strategies we can use to make city government more energy efficient, as well as plans that are transferable to the community" (City of Knoxville 2009a).

For the community assessment, Klein enrolled the City in ICLEI- Local Governments for Sustainability's (i.e., formally known as the International Council for

[19] Taskforce members included representatives from: Knox County, Public Building Authority, TVA, Knoxville Utilities Board, ORNL, Alcoa, USGBC, Knoxville's Community Development Corporation, SACE, Foundation for Global Sustainability, Metropolitan Planning Commission, KCC, Councilman Chris Woodhull, Blessed Earth, and UT (Burns, Fritts, and Weil 2009).

Local Environmental Initiatives) Cities Climate Protection program. The program provided software to inventory the City's energy consumption and emissions (City of Knoxville 2007). Six working groups were formed, each tasked with developing sector-specific recommendations for improving efficiency. These included: community involvement, goods and services procurement, energy, infrastructure, sustainable growth, and transportation. Two years later, the taskforce released their major report, which provided a blueprint for green growth in Knoxville. The report had big aims, containing 33 recommendations for improvement. Key recommendations included: implementing single-stream recycling; building the John Duncan Jr. Knoxville Transit Center to Leadership in Energy and Environmental Design (LEED) standards; focusing on energy efficiency for affordable homes; and, greening the South Waterfront redevelopment (Burns, Fritts, and Weil 2009).

Several recommendations also resulted from the Solar American City program. "Solar Knoxville," a coalition of local actors, along with the Solar America team and DOE consultants, identified "high priority barriers impeding expansion of the solar market" (DOE 2011a).[20] Several recommendations were offered, most of which focused on educating and organizing industry actors. For example, the coalition suggested conducting public "Solar 101" workshops, installing highly visible solar systems in strategic locations, as well as developing a central clearinghouse of solar actors and organizations (DOE 2011a). Many of these recommendations overlapped with those from

[20] Solar Knoxville partners include: TVA, Knoxville Utility Board, SACE, Tennessee Department of Economic and Community Development, Pellissippi State Community College, Knox Heritage, Knoxville Area Transit, Public Building Authority, Ijams Nature Center, ORNL, and Florida Solar Energy Center.

the taskforce, which may reflect the number of actors involved in both Solar Knoxville and the Energy and Sustainability Initiative.

Given Knoxville's conservative socio-political landscape, it may be surprising that no interviewee, news article, or report mentioned meaningful opposition to these early green projects. Beauchamp (2013) offered possible reasons why, first suggesting "Haslam's imprimatur neutralized the threat," but ultimately concluding that City leaders "simply avoided talking about climate change in public as much as possible." Interviewees familiar with this history overwhelmingly confirmed Beauchamp's conclusion. As one interviewee still employed with the City reflected:

> [You] were not actually able to talk about sustainability. You didn't really say that that was your goal, to be more sustainable. You talked about saving taxpayer dollars, because you had to bring people along… You can talk about saving mother earth in addition to saving taxpayer dollars. So, we still say we save taxpayer dollars, because I think ultimately you do.

When Susanna Bass Sutherland, now the City's former Sustainability Director, was asked about speaking on climate change during these early years, she responded, "Why politicize something when you can just do it?" (Beauchamp 2013). Perhaps it also helped that the bulk of the City's first sustainability projects focused on greening its internal operations rather than the more publically visible projects suggested and later taken on by Solar Knoxville and the Energy and Sustainability Taskforce.

Funding the Green Wave 2009-11

What Solar Knoxville and the Energy and Sustainability Taskforce overwhelmingly indicated was the need for funding. As one interviewee put it, "A lot of times, cities don't have money in their budgets for anything beyond basic services." This

was especially true for Knoxville where attempts to raise taxes for increased services have historically fallen flat. Perhaps somewhat fortunately, the 2008 global economic recession prompted national leaders, including the Obama Administration, to offer stimulus funding. For Knoxville, the timing was excellent. Solar Knoxville, the Energy and Sustainability Taskforce, and Ameresco had already catalogued the City's deficiencies, pushing it far along in the planning process (Galbraith 2009) and fulfilling the ARRA criteria of "shovel-ready" projects. The City received $12.2 million in ARRA funding (Brass 2010), of which approximately $2 million was awarded to Klein's Policy and Communications Department for efficiency-related projects (DOE 2010; Sustainable City Network 2009). The award was part of the DOE's Energy Efficiency and Conservation Block Grant (EECBG) program and funded seven projects, all of which addressed the deficiencies identified by Solar Knoxville, the taskforce, and Ameresco:

(1) Sustainability program manager. Over $261,000 funded an energy and sustainability program manager to handle the EECBG funding (Bass and Burns 2009; Brass 2010). Sutherland, who previously managed the South Waterfront redevelopment, was hired. Although Sutherland had secured a $400,000 U.S. Environmental Protection Agency (EPA) grant for brownfield development (Sutherland and Associates 2016), the project was largely dependent upon private investment, which during the recession stalled. Sutherland was, however, successful in building into its code several environmentally friendly requirements (e.g., permeable pavement, reflective roofs, and pollution-mitigating street lights), causing one interviewee to claim the site as "Knoxville's first eco-district." Sutherland replaced Gill, who left to earn a Master's of

Environmental Management at Yale University, as the City's sustainability coordinator (DOE 2011a).

(2) Ameresco seed funding. Approximately $282,000 served as seed money for the Ameresco deal, and in 2009, Haslam signed the $19 million, 15-year energy performance contract (Ameresco 2009; Brass 2010; Sustainable City Network 2009). The City estimated annual savings from the contract at 46 British Thermal Units (i.e., the equivalent of removing 1,650 cars from the streets), 49 million gallons of water, 18 million pounds of carbon dioxide emissions, as well as $1.1 million from utility bills (Bass and Burns 2009).

(3) Weatherization assistance. Another $200,000 went to the Knoxville-Knox County Community Action Committee's (CAC) Weatherization Assistance Program (WAP), the nation's largest residential energy efficiency program, which provides improvements for low- to moderate-income households (Bass and Burns 2009; Brass 2009). The EECBG funds were specific to low-income residents, that is households with incomes below 200 percent poverty (City of Knoxville 2009b).

(4) Green Buildings Incentive program. The City used $300,000 to launch a Green Buildings Incentive program (Bass and Burns 2009; Brass 2009). The CAC (2014) received $270,000 of those funds, which they distributed to 220 local residents to construct or retrofit Energy Star-, EarthCraft-, or LEED-certified buildings (City of Knoxville 2009b). The remaining funds were distributed to 210 residents in the form of rebates for energy audits and efficient appliances (CAC 2014).

(5) Contractor education. With $40,000, the City conducted contractor-training workshops, which according to Sutherland was essential, "so that when people want to do

an energy efficiency project, the cost won't be inflated because the contractor doesn't know how to do the project" (Brass 2009). In 2010, 146 contractors were trained in either the International Energy Conservation codes or EarthCraft House Renovation (City of Knoxville 2009b, 2016d).

(6) Photovoltaic (PV) system for convention center. An additional $250,000 funded a 28.5-kilowatt solar PV system installed on the roof of the downtown convention center (Bass and Burns 2009; Sustainable City Network 2009). Via a third-party finance agreement with TVA, an additional 90-kilowatt PV array was installed (DOE 2011a). TVA's Generation Partners program, which credited excess PV generation at the local utility rate of $0.12/kilowatt per hour, was instrumental to this investment (DOE 2011a).[21]

(7) Single-stream, curbside recycling. Lastly, $700,000 helped fund the City's single stream curbside recycling program (Bass and Burns 2009). The award paid for the cost of 75 percent of the bins (Homa 2014). The remainder, including the operating costs, was funded by an increase in fees at the City's Solid Waste Management Facility, savings from landfill diversion, and instituting a fee for backdoor garbage collection (Brown 2011; Homa 2014). In 2010, the City partnered with Waste Connections, and in October of 2011 rolled out its program. By December, the City had reached its goal of 20,000

[21] TVA's Green Power Switch program, launched with the help of SACE in 2001 on Earth Day, also worked to further clean energy production by allowing customers to buy "blocks" of renewable energy, including solar, wind, and methane-recovered (Nolt 2005). Each block costs $4 dollars and contributes 3,600-kilowatts of renewable energy each year, which is the equivalent of saving 143 gallons of gas by not driving 2,600 miles, as well as planting nearly an acre of forest (TVA 2016).

household participants and opened a waiting list, which still exists today (City of Knoxville 2016e).

The City, however, was not the only local actor to receive stimulus funding. Nearly $550 million in ARRA funds were provided to organizations in Knox County, amounting to nearly $1,251 in funding per capita (ProPublica 2012).[22] Especially pertinent to the green economy were the following awards:

(1) The Tennessee Solar Institute (TSI). Lunched by Governor Phil Bredesen, the TSI was a "state-wide solar and economic development program focused on job creation, education, renewable power production, and technology commercialization" (Solar Outreach Partnership 2014: 5). TSI, ran by UT and ORNL, distributed nearly all of its $23.5 million via two programs: the Solar Innovation Grants program, which funded productivity and efficiency improvements, and the Solar Installation Grants, which funded small-scale PV systems. TSI also received over $600,000 from the DOE's Rooftop Solar Challenge to "implement model permitting, interconnection, and net metering standards" (DOE 2011b).[23]

(2) The Carbon Fiber Technology Facility. The DOE, via its Clean Energy Manufacturing Initiative, granted $34.5 million to ORNL, Dow Chemical, and Ford Motor Company to develop the Carbon Fiber Technology Facility in the neighboring City of Oak Ridge (Huotari 2010; ORNL 2009). With the goal of reducing costs, the facility

[22] National average is $1,691 in funding per capita (ProPublica 2012a). See Appendix L for a list of the top 30 ARRA fund recipients.

[23] UT led the grant. Partners included: TVA, City of Franklin, Metro Nashville, Memphis/Shelby County, Knoxville Utility Board, Nashville Electric Service, Memphis Light Gas and Water, and Middle Tennessee Electric Membership Co-op (DOE 2011b).

provides manufacturers and suppliers with a place to test and develop carbon fiber materials. The Oak Ridge Carbon Fiber Consortium was established in 2011 as a response to this investment, attracting over 40 member companies across the carbon fiber value chain (ORNL n.d.a).

(3) CAC's WAP. In addition to the EECBG funds, the CAC's WAP received $6.2 million in ARRA funds. Between 2009 and 2011, the CAC (2013) weatherized 1,546 middle- and low-income homes or 128 percent of its goal. On average, residents are estimated to save over $400 annually on their energy bills (CAC 2014).

While stimulus money was flooding the area, the benefits of the Solar American Cities grant entered into full swing. From 2009-2010, the grant funded 17 Solar 101 workshops, educating the public on technologies, best practices, and career opportunities (DOE 2011a). The grant also funded the installation of a 2.72-kilowatt solar array on a local and historic home, which was renovated to LEED standards (DOE 2011a). Additionally, TVA's cost-share agreement funded a 4.68-kilowatt solar PV system installed on the new LEED-certified transit center (DOE 2011a). Solar Knoxville also worked with local community college Pellissippi State (PSCC) to develop a 96-hour training program for solar installation (DOE 2011a). From 2008 to 2011, Knoxville's PV capacity went from 30-kilowatts to more than 1.3-Megawatts, which is a 400 percent increase (DOE 2011a). The DOE (2011a) stated, "the solar market in Knoxville has been transformed from a small, fringe industry to one with multiple, large professional companies and a significant presence in the community's commercial sector" (p. 6).

For Knoxville, times were changing. In 2011, the Brookings Institute released their surprising report, identifying Knoxville as first in the country for green economy growth (Muro, Rothwell, and Saha 2011). According to Klein:

> I think the [Solar America Cities] grant gave Knoxville, the County, and the surrounding cities and counties and the state a really good idea for how to spend some of those ARRA dollars that came in 2009 and help us sort of set up the types of programs that would really kick off the market. (Beauchamp 2013)

That it did. Knoxville was one of the first U.S. cities to fully recover from the 2008 recession (Flory 2012). The credit for much of that growth, however, has to be attributed to ORNL, which was awarded $500 million in stimulus funding (Munger 2012), compared to the City's $12.2 million (Brass 2010). ORNL, which also has an operating budget 10 times that of the City (Beauchamp 2013), fueled the rampant growth of professional energy services, which also left the area with one of the nation's least diversified green economies. Approximately 38 percent of Knoxville's green jobs are green-collared (i.e., those requiring a modest education), compared to a national average of over 67 percent (Muro, Rothwell, and Saha 2011). The concentration of jobs in the high-tech energy sector goes a long way in explaining Knoxville's surprisingly high-wage green growth. According to ORNL's director, Thomas Mason, however, the lab cannot take all the credit. The City's sustainability work attracts a lot of start-ups that, Mason said, "want to locate in a region where that's part of the agenda. So, I think that is a smart strategy from the point of view of reinforcing the economic growth agenda of the region" (Beauchamp 2013).

Additionally, City leadership was undergoing great change. Klein had left to take a job with SoCore Energy, a Chicago-based professional energy services provider.

Haslam decided to run for State Governor and won. When he resigned early January of 2011, Daniel Brown was named interim Mayor and served a short stint as Knoxville's first and only black Mayor (City of Knoxville 2011, 2016c). Rogero also resigned, having decided to run for Mayor in the upcoming election. On a campaign of neighborhood development, inclusion, and sustainability, she ran against Mark Padgett, owner of the software company eGovernment Solutions (City of Knoxville 2011). In a low-voter turnout, Rogero won, earning 58.61 percent of the 21,072 votes cast (Balloch, Coleman, and Donila 2011). In December of 2011, she was sworn into office (City of Knoxville 2016f), becoming the City's first female Mayor (Balloch, Coleman, and Donila 2011).

Keeping the Momentum: 2012-14

In 2012, stimulus funding was dwindling, but Rogero was committed to building a stronger and greener Knoxville. In April of 2012, over 750 people gathered at Victor Ashe Park to hear Rogero's first budget address (City of Knoxville 2012a). Rogero's budget reflected her commitment, including, for example, a 25 percent increase in the City's tree-planting program, over $64,000 to hire an Urban Forrester, over $1 million to expand and improve greenways, and perhaps most importantly, nearly $150,000 to fund an Office of Sustainability with two full-time staff persons (City of Knoxville 2012a). Sutherland transitioned into the Sustainability Director position, and in July, Jacob Tisinger, a former AmeriCorps volunteer who had worked with Gill on the Solar American City project, was hired as the Program Manager. Sutherland and Tisinger were immediately tasked with seeing through extant ARRA-funded projects but also with keeping the momentum behind the green wave, despite the sharp decline in federal stimulus dollars.

With a staff of two and no operating budget, Sutherland and Tisinger had a tall order. To add to the complexity, city-run sustainability programs were rather new at the time. As one City employee reflected:

> So, across the country, what I didn't know was happening at the time, is that a lot of cities who didn't have a sustainability program, who had never heard of one, and who hadn't even thought about it, were getting sustainability directors, they were basically being born, and even the sustainability directors didn't know that's what they were.

So, with little guidance, no operating budget, a tiny staff, but strong political support from Rogero's administration, Sutherland and Tisinger got creative, engaging in a number of symbolic and public acts, applying widely for privately- and publically-funded grants, and partnering with progressive area leaders with diverse expertise and resources.

One of the first but largely symbolic acts was the City's participation in the DOE's Better Buildings Challenge program. Rogero announced the City's participation in July of 2012 at the LEED-certified Convention Center's ribbon-cutting ceremony. Launched in 2011 by President Obama, Knoxville was the first city in Tennessee to accept his challenge of reducing energy use by 20 percent by 2020 (City of Knoxville 2012b). Although Sutherland lauded the effort, stating, "By accepting the Better Buildings Challenge, Knoxville is leading by example," much of the work necessary to meet the goal was already underway via the City's Ameresco contract (City of Knoxville 2012b). Per the contract, the City was already tracking energy usage and with the planned retrofits was projected to decrease consumption by up to 30 percent (DOE n.d.a). The announcement did, however, publicize the City's commitment to energy efficiency while, as Rogero expressed, served as an invitation to "our local corporate and civil leaders to join the City in this effort" (City of Knoxville 2012b).

At this time, the City also engaged in two other largely symbolic acts. First, Knoxville joined the World Wildlife Fund's (WWF) Earth Hour City Challenge, which is a yearlong competition to promote renewable energy use and climate change resiliency. According to the WWF (2016a), "joining is easy," and "all cities have to do to participate is "report at least one commitment to quantifiably reduce greenhouse gas emissions" (WWF 2016b). Due to the Ameresco contract, that was easy for Knoxville. Additionally, the City spearheaded the voluntary adoption of the 2012 International Green Construction Code. Currently operating under the 2006 code, voluntary adoption was necessary, because, as one City employee put:

> You have to be realistic. I mean, I'd love to have it as the code, but if it all- first of all, I'd have to get it by council, and there's no way- it would have a lot of opposition to it. It's something brand new. It requires additional standards. This is not California, so we try to work with reality.

Working with the East Tennessee Chapter of the USGBC, over the next couple of years, the City launched several educational luncheons, which were well attended, typically by 40 or so local construction stakeholders. To date, no one has built to its standards. However, City officials are hopeful, as one expressed, "We still need to get takers to show, to prove it can be done."

In 2012, the City held another ribbon-cutting event, this time at the Civic Coliseum parking garage to celebrate the opening of 24 electric vehicle (EV) charging stations (City of Knoxville 2012c). The stations were a result of a partnership with ORNL (2013), which had been awarded $6.8 million in ARRA funds to install and study them in an effort to optimize the technology (ORNL n.d.b). The award was part of a larger $99.8 million DOE grant to ECOtality, an electric transportation and storage technology

company (City of Knoxville 2012c). As part of the deal, the City participated in stakeholder meetings and donated parking spaces and electricity at a value of over $200,000 (City of Knoxville 2012d). Despite the investment, the stations largely went unused. By 2014, 321 stations had been installed across the state, although less than 1,000 EVs had been sold (Motavalli 2014). Data on EV use in Knoxville proper is unavailable, however, for the 2014 National Drive Electric Week, only 16 area vehicles registered (Drive Electric 2014). In 2013, ORNL's study concluded, and the City assumed ownership. Despite low use, the City decided to keep the stations open. They negotiated a contract with CarCharging Group, which had recently purchased ECOtality. However, use was no longer free, now costing $1-2 per hour (City of Knoxville 2014b).

The City also widely applied for grants. According to Elke Weber, speaking at the 2015 Loyola Climate Change Conference in Chicago, "We have no silver bullet. All we have is silver buck-shots, which spew out in so many directions." The City of Knoxville seemed to acknowledge this, applying for grants to fund many and diverse sustainability projects. Not all were successful. Although a top contender for it's urban agricultural proposal, Knoxville did not win the 2012 Bloomberg Mayor's Challenge. Nor was Knoxville awarded the Georgetown University Energy Prize, although it was a quarterfinalist. Several proposals, however, were funded. Via an $115,000 grant from the Knoxville Region Transportation Planning Organization, the City launched Zipcar, a car-sharing service (Flory 2013). Additionally, the City won a $28,000 grant from Tennessee's Green Development Grant program to retrofit stormwater infrastructure (Tennessee's Department of Environment and Conservation 2013).

In partnership with Legacy Parks, a local nonprofit organization, the City also won a $200,000 grant from the Tennessee Recreation and Trails Program (City of Knoxille 2012e, Legacy Parks n.d.). The grant helped develop an Urban Wilderness corridor in South Knoxville, which abuts the South Waterfront redevelopment. Following the program's launch, several local actors and organizations coalesced in support. The Appalachian Mountain Bike Club (AMBC 2013), along with Legacy Parks, applied for and was each awarded a $10,000 grant from Recreation and Equipment, Inc. to develop trails. The Wood family donated nearly 100 acres, which provided key connections between existing trails and parks (City of Knoxville 2013a). Several others made donations, including the Knoxville Greenway Coalition, the Knoxville Track Club, and Ambassador and former Knoxville Mayor Victor Ashe, all of which allowed for the purchase of additional land (City of Knoxville n.d.). The coalition was also successful in blocking a proposed extension of the James White Parkway, which as Rogero stated would have bisected this "regional asset and plow[ed] through the existing and proposed trail networks and wilderness" (City of Knoxville 2013b). The coalition's success was lauded at the 2012 International Mountain Bike Association's annual World Summit as, "a new model of collaboration and innovative trail development" (Legacy Parks 2012).

The City's Office of Sustainability also was awarded a $400,000 IBM Smarter Cities Challenge grant. At the time, Knoxville was one of 33 cities worldwide to earn the award, which provided expert consultation on a sustainability issue of the City's choosing (City of Knoxville 2012f). One City employee working on the project offered a succinct summary, stating:

> Their [IBM] whole goal is to address the problem we identified, which is that there is at least $3.5 million- but probably closer to $6 million or so- donated or allocated every

> year to pay emergency utilities bills, which is for people who are sometimes coming out of homelessness or on the verge of homelessness, to help them pay that bill, to help them get back on their feet, and you know, try to keep them in their homes.

The Smarter Cities' final report confirmed these estimates, finding nearly $5 million spent annually (IBM Smarter Cities Challenge 2013). Knoxville was not alone in its challenges, and the report quoted Mayor Bloomberg of New York stating, "A growing population, aging infrastructure, a changing climate, and an evolving economy pose challenges to our city's success and quality of life" (IBM Smarter Cities Challenge 2013a: 8). IBM offered five recommendations: (1) improve coordination and communication to develop a shared vision; (2) synthesize data to enable fact-based decision making; (3) educate the community; (4) establish a perpetual funding mechanism; and, (5) engage landlords (IBM Smarter Cities Challenge 2013). To guide implementation, the City formed the Knoxville Smarter Cities Partnership, a coalition of over 20 local organizations.

In a first attempt at implementation, the Smarter Cities Partnership applied and was awarded a Partners-for-Places grant, which is a project of the Funders' Network for Smart Growth and Livable Communities. As one of 10 recipients, Knoxville was awarded $30,000, as well as an additional $30,0000 in matching funds from the United Way of Greater Knoxville and the East Tennessee Foundation (City of Knoxville 2014a). The award funded an "end-to-end education campaign to engage residents through multiple types of media, effective messaging and interactive, peer-to-peer learning," particularly in low-income neighborhoods (City of Knoxville 2014a). More specifically: $7,500 went to developing a distinct brand, "Savings in the House" (City of Knoxville n.d.); nearly $15,000 went to developing of a single-page resource guide (City of

Knoxville 2015); $2,500 paid for "DYI efficiency kits," which were provided at targeted neighborhood workshops; $1,000 went towards training institutional and community partners; $16,000 funded a door-to-door educational campaign; $5,000 paid for the development of a central website; and, $7,000 paid for a program evaluation (City of Knoxville 2015a).[24]

Despite the City's efforts to keep the green wave moving, the changing landscape proved detrimental to the solar and, to an extent, larger construction industry. The Solar American Cities program closed. The TSI, which had been established specifically to distribute ARRA funds, dissolved. Funding for the CAC's WAP was rapidly diminishing. TVA's Green Power Providers, previously known as Generation Partners, which was instrumental to the construction of the City's LEED-certified convention center and several other mid-size solar projects, dramatically reduced its capacity (Barrie 2013). When asked about the changes, one interviewee who owned a now defunct but previously profitable solar installation company, responded:

> It was just a whole series of things. There were a lot of incentives both at the federal and state and local level, and just the awareness changed. In 2005, I was setting up appointments, and there was just no one interested. In 2005, there was a building boom going on. People were making money, and they just did not care. Then in 2008 and '09,

[24] The program evaluation was conducted by UTGI. The City was mostly interested in evaluating the effectiveness of community outreach strategies. Via fieldwork and a follow-up phone survey with project participants, UTGI researchers determined community-based outreach strategies and actors (i.e., opposed to nonlocal experts) increased participation and enhanced informal communication flows among residents (see Shefner and Medley 2016).

> things really took off… So 2010, 2011, things were really going up. 2012 kind of plateaued, and then, in 2013, it really took a nosedive.

Interviewees in the workforce development stakeholder group also confirmed the solar bust. As one PSCC employee, who had worked with Solar Knoxville to develop that specialized solar installation training program, stated:

> And so, I mean, I think about all, I have trained I don't know how many solar panel installers, NAC- [National Apprentice Certification], NABCEP- [North American Board of Certified Energy Practitioners] certified, and those guys can't find jobs or just couldn't find jobs… I mean, that's the big fallacy about, everybody says that education is the root, you know, to prosperity, and it's really not if there aren't any jobs.

What the solar crash made clear was the potential danger of funding the green wave with one-off monies. The alignment of incentives at the federal, state, and local level led to rapid growth, greatly inflating demand and driving industry. When the incentives at the three levels simultaneously diminished, demand and its resultant industry plummeted. Knoxville green economy stakeholders took note, and several interviewees expressed concern that most of the City's green projects were funded with one-time grant money. While the work of Knoxville leaders, especially that of Sutherland and Tisinger, who together brought in nearly $2.5 million in unmatched grant funds and over $650,000 in new infrastructure (Sutherland and Associates 2016), was quite impressive, its sustainability was questionable. Additionally, it was exhausting. As one City employee put it, such work is "a young person's burnout job." In 2014, Sutherland left the City to pursue her Ph.D. at UT in Energy Science and Engineering, and Tisinger moved to California to take a job with Pacific Gas and Electric.

Riding the Wave: 2015

In March of 2015, Rogero announced she was running for re-election. She "promised to be a Mayor for all of Knoxville and to work with all of you [citizens and fellow workers] to build, collaborate, and create solutions for a vibrant, inclusive, sustainable Knoxville," and she continued, "That's what we've done over the past four years, and I promise you, I will work just as hard in the next four years…" Rogero ran unopposed and unsurprisingly won 3,711 or over 98 percent of the votes (Warner Brothers Insider Awards 2015). The City's Office of Sustainability continued to be internally funded. Erin Burns Gill, who Sutherland had aggressively recruited back, and Brian Blackmon, also a former AmeriCorps volunteer, replaced Sutherland and Tisinger. Still without an operating budget, Gill and Blackmon continued to work with progressive local leaders and were highly successful in leveraging extant grants to procure additional funding.

In April of 2015, TVA announced Knoxville a winner of its Smart Communities Extreme Energy Makeover project, which via weatherization, seeks to lower energy consumption, power production, and greenhouse gas emissions (City of Knoxville 2015b). The program is a result of a $3-5 billion settlement between the EPA (2013) and TVA, which had violated the Clean Air Act at 11 of its coal-fired plants. The grant application was led by the City, the Knoxville Utility Board (KUB), and the CAC specifically to support the Smarter Cities Partnership with the implementation of IBM's recommendations (City of Knoxville 2016g). With the $15 million award, the City launched the Knoxville Extreme Energy Makeover (KEEM) project, which along with educational workshops, is projected to weatherize an estimated 1,200 homes by

September of 2017 (WVLT Local 8 2015). According to Gill, who wrote the grant, the award not only helps meet the DOE Better Building Challenge's "aggressive goals," but also "recognizes the persistent challenge of more than 10,000 families who struggle with high utility bills, which are often driven up by aging housing infrastructure" (Robbs 2015). KEEM is estimated to create 120 green jobs (Robbs 2015).

As impressive as KEEM is, the program falls considerably short of the 10,000 low-income homes needing assistance, as well as IBM's recommendation to establish a perpetual funding mechanism. To address this, the City worked with KUB and the CAC to launch its Round It Up program. Starting in May of 2015, KUB customer bills were rounded up to the next dollar, and the excess change deposited into an account earmarked for the CAC's WAP. Customers are automatically enrolled but can opt out. According to Dale Grubbs, KUB's customer service manager, most negative comments about the program concern the automatic enrollment (Marcum 2015), but it was necessary, as one interviewee who works at KUB explained:

> So, some of the other utilities have done this, and the ones that got beat up didn't do it a certain way, or they didn't roll it out right, or they had the wrong message. The ones that roll it out with an opt-in, only had like five to ten percent participation. The ones the opted out had like 65 to 70 percent participation. Huge difference in monies, so we said, "Okay, let's go with the opt-out method."

KUB (2016) estimates that if only 50 percent of customers opt out, at an average rate of $.50/month per customer, the program will raise approximately $600,000 per year.

Also at this time, private industry began investing in the South Waterfront redevelopment. Because of the $400,000 EPA grant Sutherland procured in 2009, brownfield testing was already complete (Wallace, McKee, and Bruce 2015). Testing was

important because, as Rogero stated, “we have been able to tell property owners or future buyers exactly what they were getting into” (Smart Growth America 2013). To help lure developers, the City, along with the County, approved a $22 million tax increment financing proposal (City of Knoxville 2015c). A series of investments followed. Southeastern Development Associates purchased Baptist Hospital, a 23-acre abandoned site in the redevelopment zone, and began plans for 315 luxury apartments, 225 student apartments, and $270,000 square feet of retail and offices, for a total investment of $160 million (Marble Alley n.d.). Regal Cinemas signed a letter of intent, pledging to relocate and bolster its headquarters from North Knoxville, adding an estimated 70 jobs to the area (Holloway 2015). Additionally, local developer David Dewhirst purchased for $625,000 the adjacent and 13-acre, historic Kern Bakery site, which he plans to “serve as a front door to South Knoxville’s Urban Wilderness” (Sullivan 2015).

Likewise, the Urban Wilderness saw further investment. In June of 2015, the City announced funding for a bridge between the former Wood property and existing trails, which was funded by a $20,000 grant from Recreation and Equipment, Inc., $30,000 from an anonymous Legacy Parks donor, and $10,000 from AMBC itself (City of Knoxville 2015d). The AMBC (2015) of Knoxville also won $100,000 in technical assistance via a Bell Built Grant to build the “Gravity Trail,” which will meet double black diamond standards (i.e., the most difficult level of bike trail). In an effort to capture the economic gains from and potential of the Urban Wilderness, the UT Howard H. Baker Jr. Center for Public Policy conducted a study, finding that when considering direct, indirect, and multiplier effects, over $14.7 million has been added to Knox, as well as surrounding Anderson and Grainger, Counties’ GDPs (Sims, David, and Kim 2015).

The report strongly supported continued investment, suggesting that if the corridor were to become a national destination, an estimated $51.2 million in total output with nearly $850,000 in local and state taxes could be generated (Sims, Davis, and Kim 2015).

The City, however, was not the only one building on past accomplishments. In June of 2015, hundreds of composite experts gathered at the Knoxville Convention Center for the inaugural celebration of the $259 million Institute for Advanced Composites Manufacturing Innovation (IACMI). IACMI (2015) was the fifth institution chosen for President Obama's National Network for Manufacturing Innovation (NNMI) project, which aims to "bring business, research universities, community colleges, state, local, and federal governments together" through a "national network of manufacturing hubs." The Institute is regionally divided into five concentrations: vehicles in Michigan; wind turbines in Colorado; compressed gas storage in Ohio; design, modeling, and simulation in Indiana; and, composite materials and processing technology in Tennessee (UT 2015). UT, which had "emerged as a growing force in the field, as evident by its ongoing partnership between UT and ORNL, its long history in nonwoven composites, [and] its extensive collaboration with the federal government on composites research and development," was selected to lead the Institute (Tennessee Today 2015). One interviewee, who works at the KCC, described the history that led to IACMI:

> We are pretty much the world's leading region in research to lower the cost of carbon fiber with Oak Ridge National Lab and UT partnering together. So, realizing that several years ago through our Innovation Valley regional program, we got together and said, there is all this great research happening in the carbon-fiber world, and it has huge implications to the transportation/automotive sector to aviation, you know, and with the mandate, what is it, 2025, that the CAFE [Corporate Average Fuel Economy] standards

> for vehicles by the federal government is that you have to be at 55 miles per gallon, is going to be the required standard. That is not very far off. That is 10 years from now, and, um, so, and how is the automotive industry going to get here? They have got to figure out, lower the weight of the vehicle, thus carbon fiber. So, we got together, we starting bringing companies together, created a carbon fiber partners consortium, um, which you may have come across, um, and so twice a year, we have all of these industries from around the world coming to Knoxville to meet with each other, and to hear what is happening in the national lab about carbon fiber. So in conjunction with that, uh, we had some of our team members going out to carbon fiber conferences, um there is an international carbon fiber composite show that used to be in San Diego and Washington DC, and so we started attending that and said, why don't you all come to Knoxville, and so we recruited that conference to Knoxville, um, and it was here last year, um, so instead of these companies going to San Diego or DC, now they come to Knoxville… So, it is giving us face-time as an economic development community with these companies, so hey, you know, this may be three or four years down the road, but think of us, and so we are starting to see some of those companies that are locating and sniffing around here for their next site location.

According to Doug Lawyer, KCC's Vice President of Economic Development, "What's going on in composites and carbon fiber has the eyes of the automotive industry, and we are marketing to that niche… In the pipeline of what we are recruiting, close to 70 percent are manufacturing related, and a good chunk of that falls into the automotive-component sector" (Williams III 2015b). While lacking vehicle-assembly plants, Knoxville is uniquely situated to attract suppliers for the "Southern Automotive Corridor," which includes BMW, Mercedes, Nissan, and Volkswagen plants (Williams III 2015b). Workforce development stakeholders, especially the PSCC, are mobilizing to

support anticipated demands. PSCC recently opened "Megalab" at its Strawberry Plains campus. The lab also services the newly opened Career Magnet Academy, which partnered with the KCC, PSCC, and Knox County Schools to offer advanced career preparation, including dual credit and enrollment opportunities in advanced manufacturing, for high-school students. The PSCC also announced plans to expand its Blount County campus, with $2.5 million earmarked for an advanced manufacturing facility modeled after the Megalab (Sullivan 2016).

Conclusion: "Successful" Green Growth

Knoxville green economy leaders are no longer worried about speaking to climate change. In both the 2011 and 2015 Mayoral election, Rogero ran and won on a campaign of sustainability. The success of her administration, coupled with that of the ORNL-UT-TVA nexus, had brought the green wave to Knoxville. Bill Lyons, longtime Deputy to the Mayor and Chief Policy Officer, recalled, "We had this meeting where Rogero said, you guys can use this now. You can talk about carbon emissions, that's fine;" and he continued, "The environmentalism, the sustainability, its much more mainstream, and when you speak about it, people are much more accepting" (Beauchamp 2013). Other City employees confirmed the changing landscape. According to one interviewee, a longtime City employee, "Part of it is just saying the words. It doesn't even matter if everybody understands it, but they need to hear the words, sustainability, a greener Knoxville." Additionally, nearly 80 percent of survey respondents reported that they see Knoxville as a community working towards greater sustainability. To date, the City (2016h) has reduced its carbon emissions by 13 percent, so it is still a ways from meeting the DOE's goal of 20 percent by 2020. Nonetheless, given Knoxville's conservative

socio-political landscape, its progress is inspirational and instructive. As one interviewee, a sustainability director from a neighboring city, accurately put:

> I think Erin and your current Mayor are doing amazing work, and I would say in the last two or three years, I've seen and read tremendous improvements and initiatives being launched in Knoxville that probably puts Knoxville as one of the leading cities in sustainability.

The history of Knoxville's successful green growth provides credence to moderate green economy advocates that government intervention can have a big role in guiding a green transition. With ARRA, the landscape at the federal level changed, opening political opportunities for progressive action at both the state and local level. For Knoxville, the changing landscape offered two predominately separate, although occasionally overlapping, growth strategies. On the one hand, the ORNL-UT-TVA nexus, with its extant relationship to the federal government, was already well positioned for investment. The City, on the other hand, was able to successfully mobilize area leaders into coalitions to procure funding for many and diverse sustainability projects. Perhaps not coincidently, both strategies, at least initially, were pursued outside public scrutiny.

The ORNL-UT-TVA nexus closely resembles what Hess (2003) refers to as the green technopole. Fueled largely by the triple helix of university-government-private sector partnerships (Etkowitz and Leydesdorff 2000; Smith 2012), this development strategy tended towards high-tech products for global markets. This is consistent with Block (2008) and others (Block and Keller 2011; Jenkins, Licht, and Jaynes 2008; Mazzucato 2014), work, which demonstrates that despite the neoliberal attack, the government not only continued, but in many cases, increased its role in the innovation

process. Returning to Figure A.1, as depicted in Chapter 2, ORNL, UT, and TVA- a federal, land grant, and quasi-governmental institution respectively- are driving niche innovation. In the case of Knoxville, green growth in the technopole is fueling the task environment, developing high-tech products to meet global demand. Perhaps Hess (2003) is correct in describing the green technopole as dominated by the "traditional urban growth machine" and being "built on the ecological modernization of existing industries" (pg. 2, 4). As one interviewee working for Tech2020 (2014), a public-private initiative established in 1994 to grow technology-oriented business, particularly those resulting from ORNL research, stated:

> We're getting more and more involved in the green economy. Why? Because the green ideas are starting to drive economic initiatives that are creating problems innovators are trying to solve, and if you look at it from the long-term hope of implementing green stuff, that's what you want to happen. It's not green for the sake of green.

Hess's green localism, conversely, more closely resembles the sustainability impacts from work conducted by the City and its supportive coalitions. Although also successfully tapping into opening political opportunities at the federal landscape, albeit on a smaller level, the City tended to partner with local green economy leaders like SACE and Legacy Parks to promote community-oriented development. Although some efforts, such as the Regal Cinema agreement, resulted in concrete and contract-secured jobs, most growth went, at least initially, unnoticed. As early green projects gained momentum, so too spread public awareness. After considerably greening its operations and services, the City's work, especially after stimulus funding ran out in 2012, became more publically visible, both in its symbolism and material impacts. Returning to Figure

A.1, the City's efforts more closely resemble the institutional environment, serving more of a socio-political function rather than as a high-growth job or technology creator.

According to Hess (2003, 2009), green localism and the green technopole should not be considered dual but complementary process that can reinforce the strength of communities in shaping socio-environmental change. Much like the literature on green localism suggests, green growth in Knoxville, such as that presented in the Brookings Institute's report (see Muro, Rothweel, and Saha 2011), largely ignores the localist-like work of the City. Undoubtedly, the ORNL-UT-TVA nexus provided the area with several secure, high-wage green jobs. However, high educational attainment requirements continue to bar large segments of the area's population from participation. The City's work, while first working to green its own internal operations, later turned to its services and raising awareness among the local public. The economic growth resulting from its efforts, especially those like Solar Knoxville, the South Waterfront redevelopment, and the Urban Wilderness, is undeniable. However, unlike much of the work in the green technopole, the City's projects engaged the community, via coalition building and public outreach, to support industry growth. As suggested in Figure A.1, although clearly favoring techno-innovation, sustainable growth is far from monolithic, offering diverse yet interconnected strategies for green economy development.

Given the history of Knoxville's green growth, we can began to think through the propositions offered in Chapter 3:

1. Green economies share similar pressure from niche-innovators and the landscape, although effects are more variable at the local level.

2. Green economies share similar configurations of regime actors and niche-actors, although they differ by power.
3. Development pathways vary according to landscape, regime, and niche-innovation configurations.
4. Development pathways vary according to socio-environmental justice-related goals prioritized in projects within and between regime and niche actors.

Considering proposition one, with ARRA, the landscape at the federal level changed. The flood of stimulus funds highly incentivized green innovation at the local level. For Knoxville, the effects were bifurcated. The ORNL-UT-TVA nexus capitalized on the incentives, heavily investing in energy research and development. As a result, the area experienced a boom in energy-related entrepreneurial and small business activity. The City was also able to capitalize on the incentives, albeit on a much smaller scale. Perhaps not coincidentally, City investments were also largely concentrated in the energy sector (e.g., Ameresco energy performance contract, Solar American City partner, IBM Smarter Cities Challenge, and KEEM). However, whereas the City typically focused on community-oriented development, the nexus focus on high-tech, product-oriented development.

In Knoxville's green economy, ORNL, UT, and TVA are clearly powerful regime actors but so too is the City. Niche-innovators and their resultant configurations with the regime are more difficult to identify. In terms of the technopole, niche-innovators tend to either emerge directly from research conducted by the nexus or, attracted by its creative activity, decide to locate in the area. What the Brookings Institute's report (see Muro, Rotwell, and Saha 2011) identified and interviewees overwhelmingly confirmed, was the

impact of the nexus on growing business within the high-tech and professional energy sector. In the absence of engaged publics, localist niche-innovation, however, tend to be that of the City and its multi-sector partnerships. Although it is a simplification to say Knoxville's green economy consists of only these actors, it's undeniable that the ORNL-UT-TVA nexus and City are driving Knoxville's two development pathways.

As far as proposition three, on the one hand, the ORNL-UT-TVA nexus is driving Knoxville's green technopole. Referring back to Table A.3 and Geels and Schot's (2007) typology of socio-technical transition pathways, growth most closely resembles the de-alignment-realignment pathway. Via ARRA, the rapid flood of stimulus money opened opportunities in the landscape, which prompted a surge in niche-innovations. Because niche-innovators were, and perhaps still are, underdeveloped (i.e., in terms of high-tech solutions to extant socio-environmental crises), investments in novel projects proliferated. Such innovation at ORNL and UT, a national research laboratory and land grant research university respectively, is unsurprising. With TVA being a quasi-governmental utility, however, its large role in the innovation process may be best explained by Hess's (2014) concept of countervailing industry mobilization. Realizing the changing landscape and its impact on the energy production, it makes sense that TVA would partner with leading research facilities and invest in niche-innovation.

The City's investments, on the other hand, are clearly driving more localist-like development. However, Knoxville's city-led growth does not fit with any of Hess's four alternative pathways. Instead of social movement groups pressuring government to take progressive action, City leadership is behind the green wave. This suggests that perhaps a ninth pathway may need to be added to Hess's (2010) and Geels and Schot's (2007)

typologies of transition pathways. In the relative absence of social movement actors, coupled with a rapid opening in the landscape, local governments may take the lead, driving investments that closely resemble green localism. The City's gradual inclusion of projects and initiatives that engaged the public demonstrates how local and progressive government leaders operating within a relatively closed socio-political landscape can work to instill sustainable values within its communities.

Lastly, Knoxville's two development pathways vary according to the socio-environmental justice-related goals prioritized by regime and niche actors. Considering the green technopole, stakeholders made clear that market alignment was behind green investments. Such alignment was greatly facilitated by ARRA, but also by local acts like TVA's Green Power Providers program. Although green jobs in the technopole tend to pay well and be secure, few are green-collared. City-led growth, however, is more nuanced. Although growth, particularly at the start of the green wave, largely operated without public knowledge, the claim can be made that with Klein's and Rogero's push for the Energy and Sustainability Taskforce's "big aims," greening Knoxville was from the start a community-oriented endeavor. Market-based arguments always did, and continue to, provide a broad and largely agreeable justification for green investments. However, climate change and poverty are slowing becoming part of the everyday conversation.

Chapter 5: Comparative Analysis of "Successful" Green Economies

The purpose of this chapter is to provide a comparative analysis of green economy development in four locales: Knoxville, TN, Austin, TX, Chicago, IL, and Little Rock, AR. As unpacked below, all four cities have vibrant, high-growth green economies. However, they differ remarkably in terms of their landscape, regime, and niche configurations. Whereas Knoxville's green growth lacks public involvement and is largely driven by the City and quasi-governmental organizations, Austin's growth is steeped in a long and contentious history of mobilized publics. Chicago also has a long history of green growth, but it is far less contentious, as the City has tended to work alongside its coalitions and industries. Like Knoxville, Little Rock's green growth was jumpstarted with stimulus funding from the 2009 American Recovery and Reinvestment Act (ARRA), however, the City worked closely with local business to boost manufacturing and green exports, in particular. Overall, the analysis suggests that although green growth requires efforts from a similar and core group of institutions and actors, the role each plays is diverse, differing by case.

I begin with an overview of each city's landscape, illustrating demographic, economic, cultural, and environmental characteristics. I then unpack each city's green economy, paying particular attention to the role of key institutions and actors. Some of the discussion in the section on Knoxville is redundant with that in Chapter 4. However, less attention is paid to historical processes and more is paid to the roles of central institutions and actors. I conclude by returning to the four propositions poised in Chapter 3, discussing the implications of the comparative analysis on each.

Comparing Landscapes

Within the transition literature, there are no specified landscape characteristics. Instead, the landscape is often treated as a residual analytic category. As such, it has been criticized as a "garbage can concept" that accounts for many and diverse contextual influences (Geels 2011: 36). To account for the lack of specificity, I divided the concept into four major categories: demographics, macroeconomics, culture (i.e., socio-political), and environment. For each category, I assembled commonly used measures, such as population growth, median household income, and the Köppen Climate Classification. Although not an exhaustive list, these measures provide insight into each city's landscape and the pressures it exerts on their respective regimes. Table A.8 provides a comparison of landscape characteristics for Knoxville, Austin, Chicago, and Little Rock. Similarities and differences are discussed below and further unpacked in the following four sections, which discuss each city's green economy development in detail.

The three cases have important demographic differences. Chicago, the third largest U.S. city, has nearly 3 million residents and a population growth rate of almost one percent. Austin, the next most populated city, is rapidly approaching one million residents with a growth rate of 14.8 percent, making it one of the fastest growing cities in the nation. Knoxville and Little Rock are closer in size and growth, both having less than 200,000 residents and growth rates smaller than four percent. Knoxville is the least diverse, with nearly 75 percent of its population white and a little over five percent foreign-born. Likewise, only 6.8 percent of Little Rock's population is foreign-born, but nearly half of residents are black (i.e., the other half mostly being white). Both Austin

and Chicago are much more diverse, with nearly 20 percent of their populations foreign-born.

As might be expected, Knoxville and Little Rock have more similar macroeconomic characteristics than those of Austin and Chicago. For Knoxville and Little Rock, the cost of living is well below the national average and housing is far cheaper than that in Austin and Chicago. Knoxville and Little Rock have comparable GDPs, differing by less than $2 billion. Chicago's GDP, however, vastly exceeds that of Austin's by about five times. All four cities have similar unemployment rates, but Austin's is the lowest at 3.4 percent. The percent of residents living in poverty in each city is also comparable, hovering around 20 percent. Knoxville, however, has the highest portion, with over 24 percent of its residents impoverished.

The cases also have important cultural differences. Of registered voters, Knoxville by far has the most Republicans with less than 40 percent registered as Democrats. Chicago has the least, with nearly a quarter registered as Republican. Approximately 40 percent of Austin and Little Rock's voters are Republican. According to the Gallup-Healthways Global Well-Being Index, a barometer of individuals' perceptions of their well-being, the cities rank similarly with each having about 65 percent of its population self-reporting as thriving. Over a third of Austin's residents are employed in the creative sector, as defined in Florida's 2002 *The Rise of the Creative Class.* For Chicago, Knoxville, and Little Rock, less than 30 percent of residents work in occupations that require them to think creatively.

Being located in the South, Knoxville, Austin, and Little Rock share more similar environmental characteristics than with those of Chicago. Chicago is classified under the

Köppen Climate Classification, one of the most widely used climate classification systems, as humid continental, experiencing warm summers and very cold winters. Out of the four cases, it has the fewest sunny days, and in part due to its size and density, the worst air and water quality rankings. Knoxville, Austin, and Little Rock have climates classified as humid subtropical and characterized by hot, humid summers and mild winters. Each city boasts over 200 days of sunshine and ranks strongly in terms of air and water quality.

Case 1: Knoxville, TN

Green growth within Knoxville, as discussed in Chapter 4, is largely bifurcated, but in terms of growth patterns, may be best understood as trifurcated. Knoxville's green technopole is clearly driven by a core set of institutional leaders who often collaborate to advance research and develop products. Knoxville's green localism, on the other hand, is not driven by socio-environmental coalitions, as would be expected per the literature (see Hess 2003, 2008). Instead, the City, especially in waste management, public transportation, and construction, leads localist activities. In agriculture, however, the City presence is less pronounced, leaving the industry the closest in semblance to an actual localist movement. However, it is worth noting that in 2012 the City entered the Bloomberg Mayor's Challenge. It was a top contender for its urban agriculture corridor plan. Had the City won, it would have drastically changed the course of Knoxville's agricultural development.

Knoxville's green technopole

Often referred to as the "ORNL-UT-TVA" nexus, the Oak Ridge National Laboratory (ORNL), the University of Tennessee (UT), and the Tennessee Valley

Authority (TVA) are driving high-tech innovation. The bulk of that innovation comes from ORNL and UT researchers, whose combined annual research expenditures exceed $1 billion (Battelle Technology Partnership Practice 2011). An array of research, ranging from advanced materials to nuclear technology, is conducted, leaving the area without recognizable industry clusters. As one interviewee employed at a local tech-transfer organization put:

> So, because we have both UT here and ORNL here, we have the full breadth of technological innovation taking place here, and that makes it unique in kind. We are not targeted or specific to any one thing. I mean ORNL's technological research elements are just vast… There are only a handful of communities in the country that have a national lab, and not all of them have a university connected to it like we do. And so this is a very, very powerful and unique setting. So, its unique in kind but not in any specific technology.

Although lacking discernable industry clusters, within the realm of green innovation, clean energy is a recognizable strength. Research efforts include, for example, biofuel production, energy conservation and storage, computational energy systems, energy materials, distributive energy, and much more (see Bedesen Center 2016; ORNL 2016). To capitalize on this strength, the UT Bredesen Center for Interdisciplinary Research and Graduate Education, a joint ORNL-UT venture, was recently established to advance science, technology, engineering, and mathematics (STEM) research related to energy. TVA's support for energy research is twofold. First, it directly partners with ORNL and UT researchers, most recently to build and study the economic impacts of an operational micro-gird (see Burke 2016). Also, via programs like Generation Partners, it incentivizes the deployment of advanced energy technology.

The UT Research Foundation (UTRF) and Tech2020 were specifically established to handle UT and ORNL intellectual property, respectively.[25] Both are nonprofit 501(c)(3) organizations that serve a variety of purposes: pursuing funding, assessing markets, developing business plans, providing accounting services, and attracting management. The two are very collaborative. As one employee at Tech2020 explained:

> We do have an active relationship with them. Oftentimes, they'll direct their researchers to us to help them with finding ways to commercialize their ideas…and so, we actively serve the people that UTRF is identifying as potential commercializable technologies. They will hook us up directly. We do programs for them. We're active in their incubator. We're very active with UTRF.

Additionally, in 2013, the Knoxville Entrepreneur Center (KEC) was established to bolster UTRF and Tech2020's innovation efforts. Funded by private foundations and the City of Knoxville, KEC (see 2016a) is a mentor-driven business accelerator. Jointly, these organizations host several annual entrepreneurial networking events, such as Tennessee Venture Challenge (see UTRF 2016), SPARK (see KEC 2015), Startup Day (see KEC 2016b), and RAMP (see Erickson 2015).

The Knoxville Chamber of Commerce (KCC) has sought to harness this strength by targeting high-tech industry and fostering associated workforce development needs. In 2008, the KCC, along with key investors, launched Innovation Valley (2013d), a "regional economic development partnership" to "implement new aggressive business

[25] Since data collection, Tech2020 Board of Directors voted to amend its charter to focus strictly on access to capital. At the time of writing, it was undergoing reconfiguration and set to operate at a later date under a new and unspecified name (see Oak Ridge Today 2016).

recruitment and retention programs," and "enhance entrepreneurship and innovation opportunities [as well as] promote sustainability efforts."[26] Referred to as *Blueprint 2.0*, Innovation Valley is currently implementing its second five-year economic development plan, which focuses on five "target recruitment clusters:" advanced technology and manufacturing, corporate services, creative media services, energy, and transportation (Innovation Valley 2013f). Many of these targets are a direct result of ORNL-UT research (Innovation Valley 2015). The KCC (2014) has also partnered with local workforce development actors "critical to our [Knoxville] area's well-being and business success." The KCC was instrumental in founding the L&M Stem Academy, as well as the Career Magnet Academy (CMA), both of which provide high-school students with advanced career preparation in targeted fields. Pellissippi State Community College (PSCC) also partnered with the KCC and CMA to help meet industry's workforce needs. One interviewee, an employee at the Knoxville-Knox County Community Action Committee's (CAC) Workforce Connections, the area's largest workforce development organization, confirmed KCC's impact, stating, "We try to align with what Innovation Valley is doing."

Knoxville's city-led growth

Opposite the technopole is green localism, which, given Knoxville's absence of mobilized publics, is largely led by City government. As detailed in Chapter 4, the City's Office of Sustainability spearheaded many of these efforts, first working to green its

[26] Top investors, termed "Chairman's Circle Investors" include: City of Knoxville, Clayton Homes, Covenant Health, First Tennessee Foundation, Knox County, Knoxville Utilities Board, McGhee Tyson Airport, Pilot, SunTrust, TVA, Tennova Healthcare, UT-Battelle, and UT Medical Center (Innovation Valley 2013e). For other investors see Innovation Valley (2013e).

internal operations and later public initiatives. One of the City's first operations to green was waste management. In 2011, the City's Public Services Department contracted with Waste Connections to implement free curbside recycling. Also, in partnership with Goodwill, Kroger, and RockTenn Recycling, the City (2016i) offers five recycling drop-off centers. Knox County's Solid Waste Administration also contracted with Waste Connections to offer low-cost curbside recycling to residents outside City limits. Additionally, the County (2016) operates seven recycling drop-off centers, which generate over $500,000 in revenue annually. Taxpayers still, however, pay nearly $2 million a year to haul trash to nearby landfills (Knox County 2016). According to one Knox County Solid Waste employee, "Mandatory recycling would really change the landscape." The County (2016) estimates that for every one percent reduction in trash, $25,000 could be generated. Additionally, Knoxville lacks a comprehensive composting program, which would also help divert waste from the landfills.

The City of Knoxville is also driving green investment in public transportation. Providing over 3 million trips annually, the City-operated Knoxville Area Transit (KAT) provides more than 20 fixed routes, as well as several trolleys that service the downtown and UT area (City of Knoxville 2016j). KAT (2016) operates out of the Leadership in Energy and Environmental Design (LEED)-certified John J. Duncan, Jr. Transit Center, and thanks to its Clean Fuel program, over 90 percent of its vehicles use alterative fuels (c.f., KAT 2005). For those outside KAT's service area, the CAC's Transit provides demand-response public transportation. CAC Transit services approximately 900 clients daily, however, as one employee explained, they have had difficulties greening its fleet:

> There's a difference between developing new technologies, electric vehicles, hybrids, etc. for this use. For personal use, that's one issue. For public transportation use, that's a

> different creature all together, because when the car or the vehicle is out there for 12 hours a day, at City speeds, they're going to take an awful lot of abuse… We did try propane, and then the hills and driveways- we probably won't go back to propane just because you really can't… I've got eight Prius Hybrids in my fleet, and when we were applying for vehicles, we thought this was a good tradeoff.

Given Knoxville's historic air quality issues, both KAT and the CAC Transit recognize the importance of greening public transportation. In 1990, the U.S. Environmental Protection Agency (EPA) designated Knox County in non-attainment of the one-hour ground level ozone standard. Although the County achieved attainment in 2014, several factors continue to impede progress: three major intersections (i.e., I-40, 75, and 81) cut through the county; car-depended rural communities surround the City; and, the region has no car inspection regulations (City of Knoxville 2010). Achieving attainment can largely be credited to two government-initiated comprehensive transportation-planning agencies. The Metropolitan Planning Commission (n.d.), a joint venture between the City and County, provides countywide research and policy recommendations, and the Knoxville Regional Transportation Organization (2016), the area's federally designated Metropolitan Planning Organization, provides regional research and policy suggestions.

The City of Knoxville has long pushed forward sustainable construction standards. Starting with the 2008 Department of Energy (DOE) Solar City designation, it has won several grants that bolstered the area's construction industry. Most recently, the City was awarded a $15 million TVA grant to weatherize approximately 1,200 low-income homes. Known as the Knoxville Extreme Energy Makeover, the CAC's Housing and Energy Services is to administer the program. They are also set to administer the

Knoxville Utility Board's, the City's municipal utility provider, new Round It Up program, which rounds customer bills up to the nearest dollar and deposits funds into an account earmarked for the CAC's weatherization program. The CAC, along with PSCC, also provides workforce training, particularly in expanding green fields like weatherization and solar installation. Additionally, the City recently championed the voluntary adoption of the 2012 International Green Building Code, and in partnership with the East Tennessee Chapter of the U.S. Green Building Council (USGBC), worked to educate construction stakeholders on the new codes.

Knoxville's green localism

Out of the seven stakeholder groups examined, Knoxville's agricultural group most closely resembles the public-driven localism discussed by Hess (2003, 2008). Of the ORNL-UT-TVA nexus, the UT Institute of Agriculture's Extension (n.d.) is the only entity participants identified as having a community impact. Funded by the federal, state, and local government, UT Extension (n.d.) provides residents throughout the state with "research-based information about agriculture, family and consumer sciences, and resource development." UT Extension has served 4.3 million Tennesseans since it was established over 100 years ago. One interviewee, a former UT student and now urban farmer, lauded the program, emphasizing its helpfulness when she was starting her farm:

> When we first started, I would send pictures to my old professors and ask, "Why does this plant look like this? Why is this not growing?" So, yeah, I had those sorts of connections. I did the organic farming internship there, and that helped me with some marketing and those sorts of things. The nuts and bolts, really.

The Knoxville Permaculture Guild, which was started by a UT agricultural economist in 2008, also provides sustainable gardening education for the community.

The organization started as an informal networking group for residents with a passion for gardening. The group grew to nearly 1,000 residents, and in 2015 the organization registered as 501(c)(3) and established a formal advisory council consisting of certified consultants (Knoxville Permaculture Guild 2015). In additional to consultation, the organization hosts bi-monthly potlucks, a yearly lecture series, as well as other sundry events like film screenings and greenhouse tours. Several of the organization's founding and most active members serve on the Knoxville-Knox County Food Policy Council. The Council (2016a) "exists as a forum for representatives of the local food system to gather and address problems found within [local] food production, consumption, processing, distribution, and waste disposal." The Council (2012) was established in 1982 by the City of Knoxville to assess and make recommendations to address exacerbating inequalities in the local food system. Since its establishment, the Council (2016b) has launched several projects, supporting, for example, urban farming, community gardens, and low-income food access. When it was founded, the Council was the first of its kind and has served as a model for over 200 subsequent food policy councils across the nation (Spear 2014).

Two other organizations have been instrumental in driving localist agricultural development. The first is Three Rivers Market, which was established in 1981 and serves as Knoxville's only food co-op. The Market (2016a) is a customer-owned business working to support an "alternative economy based on the shared values of small, local, and cooperative growth." It features regionally sourced foods, as well as a variety of nationally sourced organic and natural foods. The Market (2016b) is home to Knoxville's first recycling center, and in 2014 it installed a 50-kilowatt solar panel on its roof and joined TVA's Green Power Providers program (Kimel 2014). Nourish Knoxville, a

nonprofit organization, is also working to support the local agricultural industry. The organization runs Knoxville's three largest farmers' markets and produces an annual local food guide. Although Nourish Knoxville (2016) did not began with a mission of food justice, its widespread success in fostering relationships between farmers, artisanal producers, and the community has shaped the organization, whose activities now include outreach, education, and advocacy. One interviewee explains it like this:

> I helped start the farmers' market, which was not an intentional food justice. There were a group of people at the time wanting to bring the farmers' market back to downtown after some major renovations, and I just decided to help volunteer to make that happen… I feel like it's [food justice] never been particularly on the forefront. At the end of the day, and this is a lot of farmers' markets, when a farmers' market applies for 501(c)(3) status, it doesn't get it. You're basically just promoting a bunch of small business. You're promoting for-profit business, it's small business, and farmers are not considered a charitable class.

In 2013, however, the market did receive 501(c)(3) status and started hosting community fundraisers, managing a calendar of local food events, and launching a series of educational events, many of which were held at the Knoxville Botanical Gardens where Nourish Knoxville is housed.

Case 2: Austin, TX

The City of Austin is located in Central Texas and is situated between two prominent geological formations: the Hill Country to the west and the plains to the east. The City (2016a) is characterized by hot summers and cool winters and boasts sunshine over 60 percent of the year. The area also has several water resources, including the Colorado River, which bifurcates the City and serves as its only water supply. It also

hosts four manmade lakes and a dense network of creeks. Additionally, North Austin sits atop the Edwards Aquifer, one of the world's largest artesian aquifers. Between the hills, rivers, and creeks, Austin is known for its unique typology, as well as for its green spaces (see Koch 2010; National Wildlife Federation 2015). There are 30 acres of parkland per 1,000 residents, for a total of 20,000 acres, and for half of the population, visiting a park is less than a half-mile walk (City of Austin 2015a). Zilker Park, touted as Austin's "crown jewel" and "most loved park," is 308 acres and receives over three million visits annually (see City of Austin 2009, 2015a).

Austin has repeatedly been ranked as one of the nation's greenest cities (see Bernardo 2015; Corporate Knights 2012; Grist 2007; Long 2010). This achievement, however, is due to the early pioneering work of socio-environmental coalitions. The 1970s environmental movement took root in Austin, organizing itself around "building a system of parks and preserves that would retain some of the natural state of hills, creeks, and rivers" (Swearingen 2010: 70). In particular, activists Mary Arnold, Susan Toomey Frost, and Roberta Crenshaw were instrumental in guiding early environmental coalitions and securing public land throughout the City, much of which is now connected via the 212 miles of trails Austinites enjoy today (see City of Austin 2015a; Swearingen 2010). *Austin Tomorrow*, the City's first comprehensive plan on strengthening the economy while protecting the environment, was critical in mobilizing its publics. The 1979 plan, funded by a U.S. Department of Housing and Urban Development grant, mandated public participation, prompting the City to launch an aggressive campaign that resulted in 56 neighborhood meetings and the engagement of 3,500 residents (Toohey 2010). This process taught Austinites how to engage in planning, enormously impacting its political

system. Prior to the plan, there were 29 neighborhood associations and afterward, 66 (Swearingen 2010). There are now over 200 (Austin Neighborhoods Council 2016).

At the same time Austin's environmental and neighborhood movements, as they have come to be known, were growing, so too was a counter movement predicated on economic growth. Austin's Economic Development Foundation, in particular, sought to capitalize on the area's cheap land, low taxes, and skilled workforce (i.e., largely due to presence of the University of Texas) by targeting high-tech manufactures (Harenberger, Tufekci, and Davis 2012). The strategy was successful, initially attracting firms like IBM, Texas Instruments, Motorola, and Microelectronics and Computer Technology Corporation, and later attracting firms like Sematech, Apple, Google, and Facebook. Since the 1960s, the growth of the high-tech industry facilitated a population boom, resulting in an eightfold increase to nearly 2 million residents (Hylton 2013). The rapid population growth put considerable strains on City and public services, driving up housing costs and impacting local politics. According to Long (2010), "Many Austinites feel that they are involved in a fight to save the city's "soul"- a battle to preserve the city's unique personality in the face of rapid growth, development, and homogenization" (p.2).

Today, the success of the environmental and neighborhood localist movements, as well as the growth of Austin's technopole, is apparent. Austin remains a high-tech mecca but is diversifying, having never quite recovering from the 2000s .com bubble (English 2009; Hartenberger, Tufekci, and Davis 2012). Its historic focus on computer technology now includes the life sciences and cleantech industries. Austin's green localism, while once highly critical of growth, is still tied to environmental and neighborhood politics but

now emphasizes smart growth. While initially concerned with land acquisition and rights, localist efforts now bleed into waste management, agriculture, and construction, three of Austin's largest green industries. For both the localist and technological movement, discourse has shifted from environment vs. development to a more three-pronged (i.e., socio-environmental-economic) approach. According to Swearingen (2020), Austin's "three-legged stool of environment, equity, and economy translates into electoral politics in terms of green, liberal, neighborhood, and business groups, and that equation is driving politics" (p. 226). Appendix N depicts a timeline of Austin's green economy development.

Austin's green technopole

In 2015, the Kauffman Index Report rated Austin the number-one U.S. city for technological innovation (Morelix et al. 2015). Nationwide, Austin has also been ranked one of the 10 best cities to launch a startup (Kavilanz 2014), sixth best employment site for STEM graduates (Jasthi 2014), top 10 up-and-coming cities for entrepreneurs (Badenhausen 2013), and number four in Forbes' most creative cities (Carlyle 2014). Often referred to as "Silicone Hills," the Austin area is shaped by its history of large technology companies and high-tech innovators at the University of Texas. Since the .com bust, the Austin area has lost over 20,000 jobs in computer design and manufacturing (English 2009), which triggered a major industrial restructuring (Hartenberger, Tufekci, and Davis 2012). At the forefront has been the life science industry. According to the Greater Austin Chamber of Commerce (GACC 2016a):

> Through a mix of strategic relocations and continued support for our existing industry, Austin's life sciences cluster has evolved into a well-rounded representation of the industry as a whole. Over 200 life sciences companies are in the region, and a workforce

> of nearly 12,300 is focused on the highest growth segments and research areas in the industry, including the specialties of biologics, medical devices, diagnostics, pharmaceutical, contract research, and others.

Although the Austin Technology Council (2014) estimates that the life science industry contributes over $1 billion annually to the region, more impressive is the rise of the cleantech sector, which is estimated to have a $2.5 billion impact (Baireuther et al. 2015). Austin Energy, ranked a top green public power utility for the last seven years by the National Renewable Energy Laboratory (NREL) (GACC 2016b), is driving the cleantech industry by incentivizing alternative energy innovation and investing in corresponding infrastructure (Austin Energy 2016a). The University of Texas is also instrumental to the cleantech boom, as well as that in the life sciences and longstanding computing industry (GACC 2016a, 2016b; Gibson and Butler 2013).

Several of the University's organizations were critical in supporting Austin's high-tech industrial growth. However, the IC^2 Institution stands out. Established in 1977 by George Kozmetsky as a "think and do" tank, the Institute seeks to catalyze regional economic development via university, government, and private partnerships (IC^2 Institution 2015). In 1989, IC^2 Institution established the Austin Technology Incubator (ATI). Since, the ATI has "helped more than 250 companies collectively raise $1 billion in investments [and] its 2012 graduating class alone raised over $175 million in investor capital" (IC^2 Institution 2015). Specific to the green economy, in 2001, the IC^2 Institution, in collaboration with the NREL, launched its Clean Technology Incubator (Masson 2000). The Incubator "does more energy research than any other university in the world" and boasts home to several international companies like Enervalis and Wetzel Engineering (ATI 2016). Recently, the University, in collaboration with the City of

Austin, GACC, and Environmental Defense Fund, established the Pecan Street Research Center (2016), which focuses specifically on advancing research and accelerating innovation in water and energy. The network is the first of its kind, boasting 1,300 members across the nation (Pecan Street Research Institute 2016).

Along with UT, the GACC and City of Austin have worked to bolster the area's technopole. The GACC, via its Innovate Austin Initiative (2015a), an economic development program aimed at making the region number-one in technological innovation, offered a five-year plan, *Opportunity Austin 3.0*. Efforts range from educational initiatives, such as "Plan for 2015," which supports techno-education and graduation rates for 15 school districts (Innovate Austin 2016a), to "Austin A-List," which seeks to increase the visibility of local innovators and startups (Innovate Austin 2016b). According to the GACC's 2015 report, its efforts witnessed the expansion of 70 existing employers, 53 new companies, and $911.3 million worth of 151 venture deals, for a total of 34,900 new jobs last year (GACC 2016b). The City has also worked to bolster techno-innovation. As part of its Small Business Program, the City (2016b) via its Entrepreneur Center of Austin offers regular classes, workshops, and other training for local startups. The City (2016c) also hosts its Austin Green Business Leaders Program, which recognizes local and voluntary businesses that invest in their program.

Such efforts have resulted in a robust research and development support industry. This includes intellectual property or technology transfer Institutions (e.g., the University of Texas's Office of Technology Commercialization and Sidley), but also networked non-profit socio-entrepreneurial enterprises. Like Knoxville, Austin's high-tech growth has required high education requirements and barred large segments of the population

from participation. In response, Austin has witnessed a burst of social entrepreneurial activity working to solve social and community issues, which include, for example, efforts from UnLdt, Center 61, Enable Impact, and Social Venture Partners. Local workforce development actors, such as Austin Community College (ACC), have developed green technology training program, and the area has witnessed a growth in STEM-based educational organizations, including Austin STEM Academy, Lake Travis STEM Academy, and the nation's only informal, nonprofit STEM-based school, GirStart. Such growth compliments the high-tech industry driven largely by the University of Texas but also by research labs operated by the large technology companies, such as IBM, Tri Environmental and Company, Dynastatica, and National Instruments Corporation.

Austin's green localism

Outside the technopole, Austin has a vibrant localist economy bolstered by City support, which years of mobilized publics worked to institutionalize. According to Swearingen (2010), "One of the reason Austin's politicians and city departments generated their green-city programs is that the environmental movement in Austin has created a powerful constituency, influencing who gets elected to the city council and mayors' office" (p. 9). The City has been particularly active and successful in areas of agriculture, waste management, and construction (see City of Austin 2013a, 2015b, 2016d). Although gains in transportation have been made, the sector is targeted for future City investment (Coffin 2016).

Austin's local food economy is strong, generating $4.1 billion in annual revenue (City of Austin 2015c) and providing approximately 43,500 jobs for a total of $1 billion

in annual earnings (City of Austin 2013a). These figures are on par with the City's other major sectors. The creative sector, including Silicon Hills, for example, generates $4.35 billion in annual economic activity (City of Austin 2013a). Despite such impressive figures, less than one percent of food consumed is produced locally (City of Austin 2015c), 17 percent of residents are food insecure, and five zip codes lack a full-service grocery store (City of Austin 2012). Food insecurity is driving up rates of diet-related illness and obesity, especially in southeast, northeast, and central east Austin where food desserts are most prevalent (McGivern 2016). Additionally, pressures from rapid population growth and local development are inflating land prices, making farming cost-prohibited (City of Austin 2012). Each day, Austin loses 9.3 acres of farmland (Christian 2014; City of Austin 2015c).

In 1995, the Sustainable Food Center, a local nonprofit organization with a mission to "cultivate a healthy community by strengthening the local food system," produced its landmark report *Access Denied*, raising awareness of food insecurity and spurring widespread action (see Sustainable Food Center 1995, 2016). The report caught the City's attention, prompting the formation of the Sustainable Food Policy Board (SFPB), which is now called the Austin-Travis County Food Policy Board (Johns Hopkins University n.d.). The Board operates much like Knoxville's Food Policy Council, but in addition to advocacy also has several working groups that actively engage with the community (see SFPB 2014a). The board consists of 17 volunteer members, who are appointed by the City government to represent Austin's diverse communities and the areas of expertise necessitated by the board (SFPB 2014b). Shortly after its creation, the City of Austin also established the Sustainable Urban Agriculture and Community

Garden (SUACG) program. While the SFPB largely focuses on urban farming, the SUACG was formed to "establish a single point of contact and streamline the process for establishing community gardens and sustainable urban agriculture on city land" (City of Austin 2016e).

Although the SFPB and SUACG have different foci, their interests often overlap. One of the groups' first accomplishments was the highly publicized and contentious revision of the City's 2000 Urban Farm Ordinance. The revision was sparked over a neighbor's complaint of a stench from HausBar Farms' compost, which utilizes black soldier fly larvae to breakdown waste (Toon 2013). HausBar Farms is located in central Austin, which is a predominately poor, minority community, historically subjected to industrial pollution and environmental degradation (see Sustainable Food Center 1995). Attune with its history, the local advocacy group People Organized in Defense of Earth and Her Resources, saw the farm, which processed chickens commercially, as another corporate assault on the community and filed a string of complaints with the City (Seale 2013). Given the complaints, the City began a review of the urban farm's operations. Non-compliance, it turns out, was not with the composting or slaughtering, but with the Farm's multi-structure complex (Seale 2013; Toon 2013). The current code specified urban farms have one structure. Few, however, including Dorsey Barger and Susan Hausmann of HausBar Farms, were aware that the City had such a code (Fedako 2013). So, the City created a working group to engage the public and draft recommendations to update and clarify the ordinance (Vickery 2014). The Group underwent a series of public meetings, resulting in several recommendations that the City adopted at a 2013 public meeting, which 400 residents attended (Vickerty 2014).

To clarify farm uses, the City approved three classifications: urban farms, which are one to three acres and may slaughter livestock at a ratio based on acreage; market farms, which are less than one acre and can raise but not slaughter livestock; and, urban farms with gatherings, which can host six events like weddings and fundraisers annually (see Groves 2013). The City's revision, however, forbid the slaughter of livestock for commercial purposes, which was a blow to the HausBar Farm owners (Vickerty 2014). Others agreed that the resolution thwarted progressive farming, including Dylan Siegler of the City's Office of Sustainability, who stated that the resolution did little to "cement our commitment to urban agriculture… I think the grassroots, sustainable local farm movement isn't necessarily embraced by city government and is not considered to be a priority" (Vickery 2014: 68; c.f., Almanza 2008). Despite challenges, urban agriculture has thrived under the code. Austin currently hosts 23 urban farms, 52 community gardens, 18 farmer markets, 1,000 food trucks, and 3,100 households raise chickens (City of Austin 2015c). Additionally, bolstered by the City's curbside organic collection pilot program, the area has a robust food recovery industry, which diverts 3,674,000 pounds of organic material annually (City of Austin 2015c).

The City acknowledges that it can't do it alone, stating "we don't have the funding," so we have "connected with several nonprofit organizations interested in promoting sustainable agriculture to form a network of organizations supporting urban agriculture" (Swan 2014). These include, for example, the: Compost Coalition (2016), which collects and composts commercial and residential waste; Compost Pedallers (2016), a 100 percent bike-powered composting center; Urban Patchwork (2016), which offers internships, start-up programs, public educational events, and community-

supported agriculture (CSA); Austin Permaculture Guild, (2016) which also provides pubic educational opportunities; the Green Corn Project (2016), which consists of volunteers who cultivate gardens for the elderly, and Urban Roots (2016), which provides youth training and CSAs. Additionally, the Austin Area School Garden Collective works to integrate agricultural education in primary schools, while the ACC (2016), via its sustainable agriculture entrepreneurship program, promotes land stewardship and encourages farming.

Austin's waste industry is bourgeoning, generating $740 million in economic activity in 2014 and supporting nearly 2,600 jobs (City of Austin 2015b). In 2011, the City adopted the *Austin Resource Recovery Master Plan*, in which they pledged their "zero waste" goal of 90 percent landfill diversion by 2040 (City of Austin 2011a). Since, they have launched several initiatives aimed at growing the recycling industry. First, they passed two citywide ordinances. The 2012 Universal Recycling Ordinance mandates business owners supply recycling bins to employees and tenants, which make up approximately 75 percent of the City's solid waste stream (Cohen 2015). And, the 2013 single-use carryout bag ordinance diverts an estimated 200 million plastic bags from landfills annually (Price 2015). The City also launched two websites, Austin Materials Marketplace and Austin Shop Zero Waste, which support business-to-business and consumer-to-business material reuse, respectively. The City has also gotten experimental. In 2014, it offered curbside organic collection to nearly 14,000 households via a pilot program it hopes to expand. Balcones Resources, which the City contracts with to collect its curbside recycling, also collects the organic material, and Organics by Gosh accepts

and processes it for profit at no cost (Price 2013).[27] Additionally, in 2015, the City launched its Austin Fixit Clinics program, which consist of volunteer coaches who help residents fix sundry broken items. The clinics are community initiated and ran.

Perhaps most impressively, the City (2016f) recently announced plans to build a $7.5 million eco-industrial park and job center for recycling, reuse, and repair industries. The City's [re]Manufacturing Hub, to be located on the 105-acre, city-owned, and now-defunct FM 812 landfill site, will add to what is becoming known as the "Southeast Recycling Corridor" (Austin Chamber 2015a; Rhodes n.d.). The project is estimated to leverage over $30 million in private-sector development and add approximately 1,200 jobs, many of which will be green-collared and pay at least the City-mandated minimum wage of $13.03 per hour (City of Austin 2014a). Although laudable, the idea of such a hub is novel and the details for the plan are not yet solidified. The City (2014a) won a $1 million U.S. Economic Development Administration (EDA) grant, but additional funding fell through and developing partners are currently being solicited (Lim 2006). Furthermore, local recycling companies are concerned the hub may hurt business. According to Bob Gregory, chief executive officer of Texas Disposal Systems, a prominent local waste removal business with over 500 employees, the City may "end up requiring that recyclables and trash collected in Austin end up at city faculties at the hub, rather than having businesses compete over materials" (Lim 2006). The City, however,

[27] The City-operated Hornsby Bend Biosolids Management Plant, which processes wastewater into compost worth $250,000 annually and sold locally under brand name Dillo Dirt (Rulseh 2014), was a likely candidate for processing the waste. However, regulations from the neighboring Austin-Bergstrom International Airport prevent nearby food waste disposal (Price 2013).

hopes that the hub will support area businesses by providing a cheaper outlet for their recyclables (Lim 2006).

Since the establishment of the Austin Energy Green Building (AEGB) program in 1990, the City has led the nation in green building standards. In the late 1980s, Austin was experiencing a population boom, and residents were concerned about balancing growth with the environment (AEGB 2011). The idea of developing a green rating system for buildings was conceived as a response to concerns expressed during a meeting at the Center for Maximum Potential Building Systems, a local education, research, and demonstration organization. The City secured a $50,000 DOE grant to develop residential standards, and additional grants were later procured to development commercial and municipal standards (AEGB 2011). The program was the nation's first and most successful sustainable building program (City of Austin 2016g). It also served as a model for the USGBC's LEED certification system (AEGB 2011). Since inception, over 10,000 homes and 15 million square feet of commercial space have been rated, successfully diverting over 20,000 metric tons of greenhouse gas emissions (City of Austin 2013b; c.f., Tinker et al. 2013). AEGB has won several awards, including the 1992 U.N. Government Honor Award, 1996 Governor's Excellence Award, and 2011 U.N. Habitat Scroll of Honor (City of Austin 2016d).

Working in conjunction with several of Austin's socio-environmental groups, the City has since launched a series of programs and local development projects to bolster sustainable construction. City-owned Austin Energy, for example, started its innovative GreenChoice program in 2000, offering customers the opportunity to purchase renewable energy. Over 7,000 residents participate (Austin Energy 2016b), making the utility first in

the nation for renewable energy sales (Austin Energy 2016c). Additionally, in 2007, Austinites voted to have all municipal buildings powered by renewables, the first U.S. city to do so (City of Austin 2014b). Austin Energy also incentivizes solar installation for homes and businesses, provides low-to-moderate income customers with no-cost home weatherization, and operates a community outreach program to educate industry and publics on renewable energy, green building, and more (Austin Energy 2016d). Thanks to the City and its collaborative public planning processes, Austin is also home to several eco-districts. One of the first is the 2000 Mueller Redevelopment (2016a). According to the U.S. Department of Housing (2016), the project is the result of:

> A decades-long community planning and redevelopment process [that] transformed the 700-acre site of the former Robert Mueller Municipal Airport on the eastern side of Austin, Texas. When the airport had been active, its proximity negatively affected economic conditions in surrounding neighborhoods, which also suffered from being isolated from downtown Austin by Interstate 35. Beginning as a grassroots effort in the 1980s, local residents articulated a new vision for the area that would relocate the airport and attract business, create a mixed-use development, and encourage a mixed-income residential community. That vision and the airport's closure in 1999 paved the way for the redevelopment of the airport site with a planned community, Mueller, consisting of various housing types, commercial properties, and a network of green spaces.

Other large sustainable development projects include the Seaholm Eco-district (City of Austin 2016h), the Colony Park Sustainable Community Initiative (n.d.), and the Downtown Austin Plan (City of Austin 2011b). In 2013, the City also adopted the 2012 International Energy Conservation Code (see DOE n.d.b) and launched CodeNEXT (see City of Austin 2016i), an initiative to update the City's Land Development Code, which

determines how land within City limits can be used. It is important to note that although the City is leading green building in Austin, its numerous socio-environmental groups have been instrumental in shaping its initiatives. As articulated in *Imagine Austin*, the City's most recent comprehensive plan, "Austin's greatest strength is its people. With this in mind, pubic participation has been and continues to be the lifeblood" (City of Austin 2016j).

Despite successes in construction, as well as in agriculture and waste management, fewer gains have been made in transportation. The INRIX Traffic Scorecard ranks Austin fourth in the U.S. for wasted traffic time (Capital Area Metropolitan Area Planning Commission [CAMPO] 2013). According to a recent poll, when it comes to sustainability, Austinites are most concerned about the inefficiency and overall infrastructure for transportation (Long et al. 2013). According to one respondent, "I love Austin, but the traffic is becoming unbearable" (Long et al. 2013: 15). Making issues worse, in 2015 the City passed an ordinance requiring companies like Uber and Lyft to be fingerprinted and regulated like taxis. The two companies spent $8 million fighting the ordinance, but when it was approved by a 56 to 44 vote, they pulled out, leaving City residents without ridesharing options (Domonoske 2016). Austinites are divided over how to fix traffic problems. In 2000 and 2014, the City and CAMPO proposed a $1.4 billion light rail system to be paid for by a "mobility" bond package, and twice it was voted down (Nofziger 2000; Whittaker 2014). While pro-rail Austinites have mobilized, forming groups like Let's Go Austin and Austin Rail Now, so too have anti-rail activists like Citizens Against Rail, which claim the rail system would only accelerate development and accompanying problems (Henry 2014).

Although there is no single solution, the City's Transportation Department and CAMPO are determined to develop a multi-modal transportation plan that Austinites can support. Recently, CAMPO released its *2040 Metropolitan Transportation Plan*, which provided "a shared vision for the development of a safe and highly functional active transportation network of pedestrian and bicycle facilities and amenities for the six-county CAMPO region" (City of Austin 2016k). Absent from the plan is the controversial light rail. Instead, the agency calls for an extensive system of buses, which outraged groups like Austin Rail Now (Orr 2015). The City also launched Project Connect (2015), which will update its 1995 *2025 Austin Metropolitan Area Transportation Plan*. Light rail is included in its plan, along with the expansion of bus lanes. Both City and CAMPO plans are currently seeking public input and slated for finalized in 2018 (City of Austin 2016k). In the interim, the City has taken a number of smaller initiatives to improve its transit system. In 2014, it updated its Bicycle Master Plan, which according to Redfin, one of the nation's most recognized real estate companies, made Austin one of the nation's most bikeable cities (Bean 2016). The City also adopted a robust Complete Streets Policy, which Smart Growth America recently ranked third in the nation (LocalLabs News 2015). Additionally, the City has partnered with the Rocky Mountain Institute to advance solutions for single occupancy vehicle ridership (City of Austin 2016k).

Case 3: Chicago, IL

Chicago, the nation's third largest city with nearly three million residents, is located in northeastern Illinois. The City rests on the southeastern shores of Lake Michigan and at the junction of two major rivers, the Chicago and Calumet River.

Chicago's waterways have profoundly impacted its development. Although no longer in operation, the 1848 construction of the Illinois and Michigan Canal, which connected the Great Lakes to the Mississippi River and Gulf of Mexico, along with an extensive railroad system, made Chicago a central transportation center.[28] Industry followed. Starting in the early twenty-first century, Chicago served as a gateway to the west, known primarily for its meatpacking and steel industries. These industries attracted immigrants, a trend that continues. Today, most of Chicago's immigrants are Latinos, but during the latter part of the 19th century, many were Germans, Poles, Italians, Jews, Czechs, and Serbs (Koval and Fidel 2006; Paral 2006). In the early 1900s, Chicago's black population also increased dramatically, which had a huge cultural impact, coined the "Chicago Black Renaissance" (Knupfer 2006). Most of these early newcomers settled in district communities, rendering Chicago one of the most segregated U.S. cities. Chicago's industrial south- and west-side neighborhoods are predominately black, while its north and northwest are largely white and south-central and west-central mostly Hispanic, with Asians clustered in the far south and north neighborhoods (Koval 2006). Post-1900 Chicago's industries also became heavily unionized. The industrial boom led to a number of race and labor disputes.

Richard J. Daley was elected Mayor in 1955, an era of machine politics, and continued his rein for over 20 years. During his service, he witnessed particular upheaval, especially during the 1960s when Martin Luther King, Jr. and Albert Raby led the Chicago Freedom Movement. Also during this time, the forces of neoliberal globalization

[28] In 1933, Chicago engineers completed the Illinois Water system, which replaced the Illinois and Michigan canal.

and deindustrialization began to hit industry. Between 1969 and 1983, the City lost 32 percent of its manufacturing jobs, dropping from an all-time high of nearly one million to less than 600,000 (Koval 2006). According to Massey and Hirst (1998), that time period "brought a stagnation of structural mobility… and a growing polarization of the occupational wage structure" (p. 56). Chicago's black and minority communities were hit particularly hard, and its labor unions were decimated, which like the rest of the United States, never fully recovered (Demissie 2006). As industry left, the City became riddled with vacant and decaying lots, of which approximately 77,000 remain (Romm 2011). The following years brought great economic restructuring, resulting in the rise of the service industry and the precariat. In the 1950s, manufacturing jobs outnumbered services jobs three to one, a ratio which is reversed today (Koval 2006). As an attempt to rebuild the City, Richard J. Daley adopted a "corporate-center" strategy of attracting and retaining corporate headquarters (Demissie 2006). However, when he died of a heart attack in 1976, his plans for urban renewal were largely abandoned.

They were in part picked up when his son Richard M. Daley was elected to Mayor in 1989. By then, his father's Democratic machine was largely dismantled, giving way to a more complex mix of patronage and governmental reformers. However, Richard M. Daley, from here on referred to as Daley, continued to rely on a powerful base that consisted of political, business, and civic elites (Koval 2006). Daley's strategy for rebuilding was centered on repositioning the City as global and high-tech, as well as transforming the downtown into a vibrant cultural mecca (Demisssie 2006). Although many Chicagoans complained about Daley's dictatorial governance, none could argue with his profound impact (Chamberlain 2004). Daley's legacy is one of

environmentalism, as he sought to make Chicago the "greenest city in America" (Saulny 2010). To an extent, he achieved it. The City has been widely recognized for its sustainability (see Bernado 2015; City of Chicago 2012a). Daley himself has also been recognized. He was awarded, for example, the J. Sterling Morton Award from the Arbor Day Foundation (1999), Urban Land Institute's J.C. Nichols Prize for Visionaries in Urban Development Laureate (City of Chicago 2010a) and, in 2010, the USGBC created his own award, the "Mayor Richard M. Daley Legacy Award for Global Leadership in Creating Sustainable Cities" (Herndobler 2010). Although the City has clearly led green growth, a trajectory Mayor Rahm Emanuel has continued since his 2011 election, a variety of other institutions and actors have been vital. The remainder of this section unpacks those players, highlighting their interrelationships and roles in greening the industrial city. See Appendix O for a timeline of Chicago's green economy development.

Chicago's city-led growth

The history of Chicago's city-led green growth traces back to the start of Mayor Daley's crusade for green roofs in 1995. That summer, Chicago had experienced severe heat. In mid-July, the central United States experienced a five-day heat wave that caused 800 deaths, 525 of which were in Chicago (Pompeii II 2010). In response, Daley appointed a Commission on Extreme Weather to investigate the event, which identified the urban heat island effect as the primary cause (Changnon, Kunkel, and Reinke 1996). In 1999, the City was awarded a $700 million settlement from Commonwealth Edison (ComEd), it's utility provider, for breaking a franchise agreement (Chicago City Hall 2008). With $2.5 million of those funds, Daley launched the 2001 Urban Heat Island Initiative. The Initiative was a pilot project that entailed the installation of a 38,800

square foot green roof on City Hall to test mitigation effects (Sorin 2013; World Clean Energy Awards 2007). Like many of Daley's green initiatives, he had gotten the idea while traveling abroad. One interviewee, a former City employee, put it like this:

> Many of the sustainability things that happened in Chicago- Mayor Daley came back, and he was driving them. He went on a trip to Germany, and he came back, and he said, you are doing a new roof on City Hall. It should be a green roof. I saw a whole bunch of them. Or, he would have these things called blue notes, these little notes that he would put on newspapers, and he would circle, do it. That's how he drove a lot of sustainability stuff.

The pilot program was successful. On a 95-degree day, the adjacent Cook County building's asphalt roof is 70 degrees hotter (Seggelke 2008). The Hall's roof is estimated to save 9,272 kilowatts, amounting to $3,600 in energy savings annually (World Clean Energy Awards 2007). Since the pilot, the City has launched several green roof incentive programs, including, for example, the 2005 Green Roof Grant program, which awarded up to $5,000 for residential and small commercial projects, as well as the 2006 Green Roof Improvement Fund, which offered a 50 percent match up to $100,000 per qualified project (Seggelke 2008). At the Chicago Center for Green Technology, a $14.4 million 2002 brownfield redevelopment with a LEED-certified green-building educational facility, also funded by the ComEd settlement (American Institutes of Architecture 2016), demonstrated green roof technology for the community (National Geographic 2010). Today, the City (2016a) boasts 509 green roofs for a total of more than 5.6 million square feet.

Since its green roofs campaign, the City has launched several other initiatives that have pushed forward green construction. Notable programs include: the 2005 Green

Homes Program, which provides builders and developers with a point-system for using green materials and technologies (Seggelke 2008); the 2009 Low-Cost Weatherization and Education Program, which along with Chicago Conservation Corps, offers hands-on training and weatherization kits to residents (Residential Energy Services Network 2009); and, the 2012 Retrofit Chicago, which is a cross-sector effort to increase energy efficiency by 20 percent by 2017 (City of Chicago 2014). To date, the program has completed over 14,008 retrofits for $9.8 million in energy savings across commercial, residential, and municipal buildings combined (City of Chicago 2014).

The City has also adopted several ordinances that mandate greener construction. The 2006 Construction and Demolition Ordinance, for example, significantly reduces landfill waste by requiring that 50 percent of debris generated on project sites be recycled or salvaged (City of Chicago 2016b). Also laudable is its 2011 Sustainable Development Policy, which mandates that projects receiving City tax incremental financing (TIF) funds meet LEED Silver standards or better (American Council for an Energy-Efficient Economy 2015). Since 2004, the City has mandated all new municipal constructions and major renovations meet LEED standards (Richardson 2010). Perhaps the most recent ordinance pushing forward green construction is the 2013 Chicago Energy Benchmarking Ordinance, which is an outgrowth of the City's *Sustainable Chicago 2015* plan. One interviewee working at the USGBC, Illinois Chapter described its impact like this:

> Buildings in Chicago are now energy benchmarking. So, every building, it does not matter if they are LEED-certified or not, every building that is over 50,000 square feet is benchmarking and learning more about their energy use, and we are seeing a huge increase in awareness about energy use and an interest in wanting to learn more. They're like, hey wait a minute, now that I know what my score is, what can I do? What are the

> low-hanging fruit, low-cost options? What are the, you know, if I had capital that I could spend, then what is my rate of return if I do that? And so, we are partnering with other organizations and doing trainings to help connect building owners and operators, as they are learning about their energy score, on what they can do. I think that is a good example where you are not requiring buildings to do anything different other than to learn about their energy use, but it is automatically leading to a conversation.

Although the City is clearly at the forefront of green construction, several other nonprofit organizations and local businesses have been instrumental in driving growth. In the above example, the "support of other allied organizations, USGBC-Illinois staff and volunteers have helped the City of Chicago implement its energy benchmarking ordinance by providing 35 trainings for nearly 600 building owners, operators, engineers, and energy service professionals" (USGBC 2015b). That USGBC interviewee identified above described the organization's relationship with the City and its support for the ordinance by stating:

> I think of the City more as a partner than as a, you know, a government body you have to pressure. I think that they, you know, there have been leaders along the way over the last 20-30 years who kind of recognized the benefits and liked to highlight the leadership of the City in a green short of way, and so they have been really eager, they have been very receptive to ideas, and they have been very eager to leverage our membership and our network to help push things forward. A good example is, the City of Chicago, they have a sustainability plan. Part of that was an energy-benchmarking ordinance. They leaned on our members to see how the policy should be crafted, and now they are leaning on our, the sustainability professionals in Chicago to help actually implement the energy-benchmarking ordinance. How do you train building owners to benchmark their buildings? How can you provide services to building operators, so that they can do it in a more

> energy efficient way? How do you connect them to the resources so that they learn about their energy use, and they can become more energy efficient?

The area's large corporate headquarters are also driving demand and support for green construction. Keeping with the energy-benchmarking example, the USGBC interviewee explained:

> There was opposition like the association that manages big buildings. They did not like this idea. Like, it's going to cost more us to be able to do this analysis. So, what ended up happening was, we were able to build a coalition of 11 companies who manage big buildings and were already energy benchmarking. So, they were like, this is just like common sense. I don't know why you aren't doing it? So, it was really helpful to get big companies, you know, like Jones Lang LaSalle and other associations like Ashrae who are experts in doing this become the advocates for it.

Local nonprofit organizations are also contributing, such as Elevate Energy (2015), the Neighborhood Technology Center, and others, which, for example, were critical in mandating that residential real estate listings disclose energy costs. Recently, the City has earned several accolades for its green building efforts. Retrofit Chicago received the 2015 Midwest Energy Efficiency Alliance's Inspiring Efficiency Impact Award (Clotfelter 2015). And, among other recognitions, the City was honored for its leadership in LEED, having greatly contributed to the state's recognition three years in a row for the most green square-footage in the world (McCadden 2016).

Local government is also greening Chicago's transit. Area transportation is predominantly run by two separate but collaborative organizations. The first is the City of Chicago's Department of Transportation (CDOT), which is responsible for the planning, design, construction, and management of streets and streetscapes, as well as rails,

bridges, sidewalks, and alleys. Since 2004, CDOT has worked to integrate sustainability into its practices and is perhaps best recognized for its pioneering Green Alley program. Over 25 percent of Chicago's surfaces are paved, and due to climate change and the increasing number of extreme rain events, the City's overflow system was and continues to be overtaxed (Johnston, Nicholas, and Parzen 2013). Chicago has approximately 1,900 miles of alleys, most of which lack a connection to the City's sewer-stormwater system and are subjected to frequent flooding (City of Chicago 2010b). Although the City could have invested billions of dollars to install an underground storage system, Daley insisted to experiment with alternative techniques like permeable pavement (Johnston, Nicholas, and Parzen 2013). Janet Attarian, CDOT's Project Director, took up the challenge and began by examining LEED standards, which at that time only existed for buildings, and by adopting applicable strategies, developed and launched the 2006 Green Alley Pilot Program. Through considerable experimentation over the next three years, kinks were worked out, leading to program permanence, the 2010 *The Green Alley Handbook*, and recognition from the American Society of Landscape Architects (2009). Attarian's LEED-based research also led to the adoption of the 2006 Complete Streets Ordinance, which too resulted in several award-winning projects (see Alta Planning and Design 2016).

CDOT also runs the renowned Greencorps Chicago program. Launched in 1994 with a $250,000 HUD Community Development Block Grant, the program was originally housed in the Department of Environment.[29] Greencorps is the City's "green

[29] At the end of the 2011 calendar year, the City of Chicago's Department of Environment was dissolved and employees were dispersed throughout the City's other departments. According to one interviewee, a

industry job training program for individuals with barriers to employment" (City of Chicago 2013a). Nearly 90 percent of its participants are ex-offenders (Institute for Sustainable Communities 2011). The City, via an array of public-private partnerships, offers a one-year paid apprenticeship in an environmentally related job with transferable skillsets, such as in horticulture, landscaping, carpentry, ecological restoration, and more (City of Chicago 2013a). The program also offers various counseling services to prevent participants from engaging in the behaviors that landed them in trouble. Potential participants undergo a rigorous screening process, so to select those most motivated to better their lives. Each spring, 40 to 50 Chicagoans are hired, amounting to approximately 340 participants since the program's founding (City of Sustainable Communities 2011). Greencorps has a 75 percent placement rate with some 47 local companies having hired graduates (City of Sustainable Communities 2011). Greencorps Chicago is one of the nation's only government-led training programs working to integrate disadvantaged populations into green jobs.

More recently, CDOT has launched two other programs that contribute to the City's green growth. Initially funded by a Congestion Mitigation and Air Quality Improvement grant and the City's TIF program, Divvy, the largest bike share program in North America (Bakula 2015), services 56 percent of Chicagoans and has stations in 40 percent of the City. Although the program was launched in 2013, its origins date back to Daley. As one long-time CDOT employee explained:

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former Department of Environment employee, the newly elected Mayor Rahm Emanuel wanted to embed sustainability more deeply into City operations and so reassigned the employees into other departments based on their expertise.

> Our previous Mayor went to Vélib' in Paris and wanted a bike share. The technology wasn't there, so the decision was made to hold off. With the new administration, in his transition plan, Alderman, uh Alderman- I have been meeting with him too many times- Mayor Emanuel, actually, had in the transition plan to launch a robust bike share system.

The program, managed by Motivate, boasts nearly 500 stations (Greenfield 2016) and offers annual memberships for $75, as well as a 24-hour pass for $9.95. Although the program has been quite successful, having over 30,000 members, most of whom based on a recent survey, self-reported that the program saves them about $800 annually, participation is stratified. As that CDOT interviewee explained:

> Our membership is about 70 percent Caucasian. It is about 65 percent male. The average age is 36 or 37, and we have about 30,000 members, and I think 90 percent are college educated, and higher income levels too. So, what we have done recently is, we just rolled out a program in July called A Divvy for Everyone Program, which is a $5 membership program for low-income individuals and families to use the system. It is $5 for a year. You can pay in cash… At the same time, we are partnering with Slow Chicago, which is a nonprofit organization that is trying to get more black and brown communities on bikes for any purpose- for transportation, for recreation, for- that is their goal to change the- there has been a bit of a stigma, and it varies in the different communities, a bit of stigma against riding bikes in the Latin America and black communities… It became this cultural thing where you were striving to own a car, so you didn't want to ride a bike, and if you rode a bike, it was because you couldn't afford a car.

So far, over 1,300 low-income residents have joined the program (Greenfield 2016). Despite inclusion efforts and an extensive membership, over two-thirds of the program's revenue is generated from the sale of 24-hour passes to visitors, which lends credence to Chicago's success at becoming a global city.

Based on a 2012 pilot program, CDOT recently launched its citywide Make Way for People program. The initiative "aims to create public spaces that cultivate community and culture inside Chicago's neighborhoods through placemaking" (CDOT 2016a). The initiative includes four separate but related programs: People Spots (i.e., parklets), which are temporary platforms, typically in parking spaces, that serve as outdoor space for seating and dining; People Streets, which convert excess asphalt like cul-de-sacs into year-round hardscape public spaces; People Alleys, which allow for artwork, seating, and other activities; and, People Plazas, in which malls, triangles, and other unused space is transformed into programming and retail opportunities (CDOT 2016a). This initiative is unique in two ways. First, it has no operating budget. As a different CDOT employee explained:

> We don't provide any funding… Every time, I get asked, so why aren't there more, and I am like, hum, because you gave me no budget. So we really, it is all about partnerships. Our Make Way for People program is all about partnering with the community, so what we did is we said, well, nobody is going to give us any money to do it. So one, what we are going to do is to one make it legal, because before it wasn't legal, and two, there are a lot of costs. We have sold our parking spaces to a company, and so if anybody takes a parking space, they are suppose to pay for that, which is thousands and thousands of dollars… and also the way our fee structures were set up, you had to pay like the value of the land. Anyway, again, things did not make sense, so we made and wrote a new ordinance that made it so basically, so you could get a permit for $75. That was it. It did not require going to Council. You could do it with CDOT.

The new ordinance greatly streamlined the process and is expected is to contribute to the success of the program, which is still in its infancy. Although People Spots, Streets, and

Alleys are not unique to Chicago, the People Plaza program is its own brainchild. As that same CDOT employee continued:

> We are doing something that, as far as I know, has never been done. Anywhere. I wish it were, because I would love to be able to look at it, to have a model. We are figuring it out as we go, but essentially what we did is we said, okay, here are all these spaces. They are scattered throughout the City, like I said, some are loved, some are not loved, some have much more economic value than others. We said, okay, we are going to group them all together. We went to our municipal marking folks in our finance department and we got carved out, which as far as I know, they have not done for anybody else, marked sponsorship, retail, and advertising rights in the plazas, and we put it out an RFP [request for proposal] for a private partner, and we said, we will give you the rights to do those things. In return, you have to take all the revenue that you earn from that, and you have to plug it back into the plazas. You have to partner with local community groups and local retail, and you have to activate the plazas, maintain the plazas, and then propose to us a sort of a profit-share once you meet all of our criteria. So, we just got that contract approved by council in May, and we are in theory launching this week.

Latent Design Corporation, the selected developer, is contracted to develop 10 plazas per year in different districts (City of Chicago 2015a). The innovative program is poised to become a national model.

The Chicago Transit Authority (CTA 2016a), an independent governmental agency and the nation's second largest transportation system, is Chicago's other major transportation provider. CTA has 1,888 buses that operate 130 routes across 1,301 miles, as well as 1,492 rail cars that operate eight routes across 224.1 miles of track (CTA 2016a). CDOT and CTA are close partners. "CTA buses run on the streets CDOT builds, and CTA trains operate on a rail network that includes 50 miles of track and more than 50

stations built and owned by CDOT" (CDOT 2016b). CTA also has several greening initiatives, but unlike CDOT, they are focused less on civic engagement and more on internal operations. These include, for example: operating 250 hybrid buses, amounting to 15 percent of its bus fleet; via $2.2 million in federal funding, operating two all-electric busses (CTA 2016b); including front-mount bike racks on all buses; providing bike parking at 130 of its 144 stations (CTA 2016c); via its Station Renewal Program, retrofitting lighting in subways and approximately 100 rail stations; installing a 12.8 kilowatt solar panel installation at one of its busiest rail stations (CTA 2016d); and instituting a robust recycling system that includes oil, antifreeze, glass, water, plastic, aluminum, batteries, and newspaper (CTA 2016d). CTA (2016e) was also a partner in developing the 2012 *Chicago Climate Action Plan* and *Sustainable Chicago 2015*, and contributes to the Illinois Climate Change Advisory Group and American Public Transportation Association's Climate Change Working Group.

CTA is overseen by the Regional Transportation Authority (RTA 2016), charged with transit planning for the six-county Northeastern Illinois region, and also overlooks Metra and PACE. Metro (n.d.) is a commuter rail services that operates seven lines that connect to the greater region, and PACE (n.d.) is a suburban bus transit provider, which covers 3,446 square miles. Along with CTA, these organizations recently published their *Chicago Green Transit Plan*, which quantified benefits from existing and potential regional public transit and identified strategies to increase ridership and promote transit-oriented development (RTA 2012). Other important regional transportation actors include the Chicago Metropolitan Agency for Planning (CMAP), which is the official regional planning organization for northeastern Illinois. CMAP (2014) does applied research and

planning for the region's 284 communities not just for transportation but also "housing, economic development, open space, the environment, and other quality of life issues." The Chicago Department of Aviation (CDA), which manages the area's O'Hare and Midway International Airports, is also working to go green. CDA's 2012 *A Sustainable Path* report documents its recent sustainability initiatives, which include natural resource conservation, operational efficiency, and social responsibility, as well as its future goals, which include reducing energy and water consumption by 15 percent, among others, over the next few years.

Chicago's green localism

In waste management, the City is also making headway, but it is largely driven by green localism. As one of the first great industrial cities of the nation, Chicago was also one of the most polluted. Chicago has more landfills per square mile than any other U.S. city, and each year, every Chicagoan produces about a ton of trash, nearly 20 percent more than the U.S. average (Pellow 2002; Zimring and Rathjue 2012). Historically, Chicago's waste system has been at the forefront of the environmental justice movement, with 90 percent of its waste being sent to Chicago's predominately black south side (Pellow 2002). The south side has over 25 square miles of landfill and a disproportionate number of Superfund sites, which, according to a 1983 study, accounts for why cancer rates are double those in the rest of the City (Zimring and Rathje 2012). In 1995, after considerable public outcry, largely prompted by civic groups like the People for Community Recovery and the Citizens Against Waste Disposal (Pellow 2012), the City, again under the direction of Daley, embarked on a large-scale municipal recycling initiative known as its "Blue Bag" program (Pellow 2000). The contract was awarded to

Waste Management, Inc. (WMI) and was largely supported by local civic groups, which was quite surprising given the company's long history of locating disposal sites in low-income and minority areas (Pellow 2000). Anne Irving, the executive director of a local public interest group, describes how WMI was awarded the contract:

> There was a deal made behind closed doors- this would be the new program. It's easy to see how this happened, in a sense. They [WMI] also have a close relationship with the Daley family. Mayor Daley's brother sits on the board of Weelabrator Technologies [owner of the now defunct Northwest incinerator], which is a subsidiary of WMI [and he] receives a $40,000 a year stipend for doing basically nothing. And you know, WMI has been sponsoring a lot of city-greening activities and things of that nature. I think the most telling thing about this relationship between the city and WMI was that the city chose this program. (Pellow 2000)

Beginning in the mid-century when most of the City's contracts were managed by Dutch and Italian mobs, Chicago's history of waste management is one of corruption (Zimring and Rathjue 2012). From 1992 to 1996, the Federal Bureau of Investigation, under "Operation Silver Shovel," investigated and unearthed a system fraught with bribes, money laundering, and illegal dumping (McRoberts and O'Connor 1998). The investigation led to the conviction of 18 Chicagoans, several of which were aldermen and inspectors (Zimring and Rathje 2012). Perhaps unsurprisingly, the 1995 Blue Bag program was a bust with only eight percent of waste recovered from the 600,000 homes served (Zimring and Rathjue 2012). In 2007, Daley revamped the program, rolling out its Blue Cart system in seven neighborhoods. The program was not terribly successful, and when Mayor Emanuel was elected, he embarked on an aggressive reform (see Belkin 2011; Weatherford 2011). In 2013, he introduced citywide recycling, stating "You cannot

be a green city and not have recycling citywide" (Baker 2013). Despite reforms, less than 11 percent of Chicagoans participate (City of Chicago 2015b). The 2011 Chicago Zoning Ordinance, which bans community gardens and urban farms from accepting food waste and composting off-site, also does not help (Baker 2015).[30] Nonprofit groups like the Chicago Resource Center and Our Roots, both of which offer recycling services, are trying to pick up the slack. Chicago also has number of research and advocacy groups working to improve the waste system, including the Chicago Recycling Coalition, Chicagoland Environmental Network, and Delta Research.

Grassroots efforts in urban agriculture have been far more successful than those in waste management. Chicago is undergoing an urban food revolution, and at the forefront is civic activist Ladonna Redmond. Redmond's activism began in 1999 when her son was diagnosed with severe food allergies, and so, as a concerned mother, she began researching and learning about the industrial food system (Jones 2009). Redmond was horrified and went on a search to find affordable organic food in the City, which ended in vain. So, she started growing her own garden, and her neighbors' increasing interests in participation prompted her to launch the Institute for Community Resource Development, which secures empty lots from the City, offers technical and educational services, manages a farmers' market, and is opening a community-owned grocery store (Jones 2009; Maidenberg n.d.). Other prominent and early activists include: Les Brown, who started Growing Homes to provide low-income job training and food to area markets

[30] Since data for this research was collected, the City modified its Chicago Zoning Ordinance, allowing community gardens and urban farms to commercially compost food waste generated offsite (Advocates for Urban Agriculture 2015).

(Doster 2008); Orin Williams, founder of the Center for Urban Transformation, a sustainable food advocacy initiative (2015); and, John Edel, who has launched several successful green nonprofit organizations, including the Chicago Sustainable Manufacturing Center, Bubbly Dynamics, and The Plant (Baker 2010). Advocates for Urban Agriculture (AUA), a loose network of organizations and individuals, were also instrumental, having often worked closely with the City to promote urban agriculture (Doster 2008; Mosby and Neiden 2015).

AUA, along with other local organizations, collaborated with the City to develop the 2011 Chicago Zoning Ordinance, which greatly eased urban farm regulations and is commonly credited as the catalyst for Chicago's food revolution (Mosby and Neiden 2015; c.f., Millennium Reserve 2015). Perhaps it was. In 2010, there were two urban farms that totaled a half-acre and now there are over a dozen that total 20 acres (Mosby and Neiden 2015). According to Emanuel, the ordinance is one step "in the City's comprehensive plan to increase food access and eliminate food deserts" (City of Chicago 2011). In addition to advocacy, rising rates of obesity, food-related diseases, food insecurity, and food deserts, as well as its 77,000 vacant lots, spawned the City's interest in promoting urban agriculture (City of Chicago 2013b). In 2011, Emanuel initiated a series of workshops and forums that engaged over 400 residents interested in improving food access and quality, resulting in its 2013 *A Recipe for Healthy Places* plan (City of Chicago 2016c). Several of the plan's recommendations the City has already initiated. Two influential programs include: the 2013 Farmers for Chicago program, which via a $300,000 National Institute of Agriculture grant, provided five acres of vacant lots, technical assistance, and job training for community organizations to start an urban farm

(City of Chicago 2013c); and, the 2014 Farmers' Market Promotion Program, which via a $88,908 U.S. Department of Agriculture grant, provided support for three markets in low-income neighborhoods (City of Chicago 2014b).

Although the number of Chicagoans residing in a food desert has decreased by 40 percent in the last five years, over 383,000 residents still do (Seggelke 2013). According to a recent study, one in five Chicagoans are unsure where they will get their next meal, and in some low-income neighborhoods, up to 35 percent of the population is food insecure (City of Chicago 2013b). Chicago's predominately black south side, "once a home to smog-belching factories and industrial meat-processing plants," aims to revitalize the blighted community by turning it into "one of the world's greatest eco-districts" (Barth 2014). Although *Green Healthy Neighborhoods* is a 10- to 20-year city-initiated plan, it is an outgrowth of grassroots movements (Barth 2014; c.f., City of Chicago 2016d). The three-mile New Englewood Re-Making America Trail, which will cut across approximately 100 acres of city-owned vacant lots, is at the heart of the plan (Rotenberk 2012). The plan bolsters work already taking place, including three urban farms: Growing Homes, Honore Street Farms, and Perry Street Farm (Rotenberk 2012). The Academy for Global Citizenship, which features on-site gardens and an all-organic meal program for students, is also located on Chicago's south side (Van Horn 2011). The plan is also sparking entrepreneurial activity, including, for example, Angelic Organics Learning Center, The Plant, and Experimental Station, which recently established 61st Street Market, the community's first farmers' market.

The City's urban revolution is also starting to attract commercial interests. Last year, the City conducted its *Chicago Sustainable Manufacturing Industries* study, finding

somewhat surprisingly that food production was the second largest subsector, accounting for 12 percent of total output. Several new and innovative businesses are popping up. Method Products, a manufacturer of consumer products, recently constructed a new LEED-Platinum certified plant in the Pullman neighborhood, its first new factory in 30 years (Mosby and Neiden 2015). The plant features the world's largest rooftop greenhouse, which is expected to produce 1 million pounds of food annually or the equivalent of 40 acres at a conventional farm (Mosby and Neiden 2015). Coming soon is The Roof Crop, which will install, lease, maintain, and harvest vegetables from area businesses with existing or emergent green roofs. According to co-founder Molly Meyer, including money from the lease and energy savings, "We expect that the building owner can recoup the cost of the green roof in five to ten years. A typical green roof has a payback period of 20 to 25 years" (Baker 2016). Other innovative companies, for example, include: e.a.t Spots, which transforms unused newsstands into healthy food kiosks (City of Chicago 2014c); Neighbor Carts (2011), which transports healthy foods to corner stores in food deserts; and, Uncommon Ground, a restaurant that harvests food from its 4,000 square foot roof, which is also the first certified organic rooftop farm in the United States (Mosby and Neiden 2015).

Chicago's green technopole

Although Chicago has one of the most diverse U.S. economies (Moberg 2006; World Business Chicago [WBC] 2016a), several sectors have emerged as strengths. Home to 90 hospitals and six accredited medial schools, one of the City's strongest is the healthcare sector, which accounts for $38.8 billion (i.e., seven percent) of gross regional product and employs 14 percent of the workforce (WBC 2015). Chicago is also a leader

in biotechnology, with 106 companies contributing $12.4 billion to the gross regional product in 2015 (WBC 2016b). In addition to housing eight biotech-related research parks and innovation hubs, the City is home to two of the world's top universities for life sciences, the University of Chicago and Northwestern University, which jointly received nearly $400 million in National Institutes of Health grant funding last year (WBC 2016b). Although Chicago's manufacturing sector has greatly declined since its hey-day, considerable gains had been made in advanced manufacturing (see City of Chicago 2013d; Koval 2006). The Chicago Metro area, for example, is the second largest U.S. employer in pharmaceutical manufacturing (WBC 2015b). Chicago is also ranked first among other U.S. metros for food manufacturing (WBC 2016c) and third in automotive manufacturing (WBC 2016d). Overall, Chicago is number two in the nation, behind Los Angeles, in total manufacturing gross product, rendering it "still a manufacturing powerhouse" (City of Chicago 2013d).

Perhaps most impressive, however, is the City's emergence as a high-tech hub over the last decade. Between 2011 and 2013, jobs at tech companies grew 19.3 percent, making the City sixth in the nation's top tech markets (Illinois Science and Technology Coalition 2014). A new startup is launched every 48 hours, recently including companies like Groupon, GrubHub, and Braintree (Natasha Loder 2013). Last year, total funding to Chicago-based startups was 50 percent higher than the previous (Kelly 2015). River North is attracting the most startups, accounting for 38 percent of all tech deals in 2015 (Pletz 2016). Although, Fulton Market, home to Google, has the highest concentration of tech companies (i.e., 45 percent), West Loop and Calumet are also hot spots (City of Chicago 2013d; Pletz 2016). The place to watch, however, is Goose Island. Goose Island,

the 160-acre man-made island located at the confluence of the north and south Chicago River, may be best known for its beer and industrial decay (Latrace 2016). Once home to industries like Peoples Gas, Light and Coke Co., American Varnish Company, and Grey, Clark, and Eagle, Matt Garrison of R2 Companies is one of several developers trying to turn what was once nicked named "Little Hell" into "Innovation Island" (see Dallke 2015; Latrace 2016). According to Garrison, it is challenging shifting the perception "from a somewhat mysterious industrial zone," but we already seeing tech companies "at the edge of River North, West Town, and the Clybourn corridor refer to themselves as part of the Goose Island neighborhood" (Lactrace 2016). Although the development is far from complete, there has already been substantial investment, including Wrigley Innovation Center, Kendall College, UI Labs, Amazon, and more (Latrace 2016).

For some time Chicago has been compared to Silicone Valley and even Austin's Silicon Hills, although until recently it was usually unfavorably (Pletz 2014). So, what happened? Well, the costs of new technologies like 3-D printers have dropped substantially, driving down the cost of startups (Henry 2015; Kelly 2015). Historically, although the area produced several top-notch innovators, especially being so close to the University of Illinois at Urbana-Champaign and its top-ranked engineering program, many left because of the lack of high-dollar venture capital (Henry 2015). While lower technology costs have encouraged more to stay, industry leaders have also mobilized, forming funding networks and attracting firms like the newly established Chicago Ventures, Hyde Park Angels, Pritzker Group, and Citadel Investment Group (Kelly 2015; Loder 2013). In addition to growing financial support, the City offers a variety of other new resources. In 2012, the Chicagoland Chamber of Commerce, for example, launched

1871, an incubator for digital tech companies, which was so successful, in 2014 it expanded to include food, education, and financial technologies (Accenture 2016). Chicago is home to 10 major tech incubators, but is poised to get one more, the $35 million Polsky Center for Entrepreneurship and Innovation, which will combine and expand research at Chicago's major universities (UChicago 2016). And of course, the area's growing talent base is also attractive. Chicago has three top-ranked public high schools for STEM education (i.e., Northside College Preparatory High School, Payton College Preparatory High School, and Jones College Prep High School) (U.S. News 2016), and offers several other award-winning STEM-based schools like Austin Polytechnical Academy (see City of Chicago 2014d).

One other major contributor to Chicago's rapid high-tech growth is the City itself. Although interest in developing into a global high-tech hub dates back to Richard M. Daley, under the leadership of Mayor Emanuel, the City has undergone a number of initiatives to spawn targeted growth. In 2013, the City released its *Chicago's Sustainable Industries: A Business Plan for Manufacturing* report, which, a first of its kind, was "the result of a collaboration by industry leaders and local government agencies on a comprehensive strategy to reinforce and expand Chicago's manufacturing base" (City of Chicago 2016e). The report outlined four distinct strategies, but most of all emphasized coordinated and smart growth across the City's 26 designated industrial corridors (see City of Chicago 2013d). While recognizing the effects of deindustrialization, especially aging infrastructure, the City, along with the Illinois General Assembly, invested over $1.3 billion via the Energy Infrastructure Modernization Act, to update ComEd's electrical grid and get industry "wired" (City of Chicago 2012b). Additionally, in an

attempt to recruit and retain talent, Emanuel initiated the annual ThinkChicago: Lollalooza, in which he invites 125 of the area's elite technology and engineering students to meet with high-tech leaders while attending the City's premier music festival (see City of Chicago 2016f). In a neoliberal era where most governments are thought best to stay out of the way, the City of Chicago is demonstrating that collaboration can help industry grow.

Case 4: Little Rock, AR

The City of Little Rock is situated in Central Arkansas, which rests at the junction of five major geographical regions: the Ozark Mountains, the Arkansas Valley, the Ouachita Mountains, the Gulf Coast Plains, and the Delta. While steep slopes that jut out from the Ouachita Mountains characterize the western portion of the City, the northeastern and southern portions are much flatter and fraught with streams and alluvial soil. The Arkansas River abuts the northern and eastern side of the City, separating it from the City of North Little Rock. Both sides of the river are lined with a 24-mile trail system, known as the Arkansas River Trail, which connects with the 224-mile Ouachita Trail (Arkansas Department of Parks and Tourism 2015). The City is home to 60 parks, many of which are connected by its 36.8 miles of bike paths (City of Little Rock 2015a). Little Rock also houses America's largest urban wetland, Fourche Creek, which encompasses 1,800 acres of swamps and low lands (City of Little Rock 2015a). In addition to its wetland and park system, over a third of City land is undeveloped, giving credence to Arkansas's claim as "the natural state."

Forbes recently ranked Little Rock one of the nation's cleanest cities (Brennan 2011). The City has also been ranked the sixth happiest in the nation (Lubin and Jenkins

2011), first of America's 10 greatest places to live (Kiplinger's Personal Finance 2013), and one of the top performing U.S. metro areas (DeVol, Bedroussian, and Klowden 2011). The City also has one of the fastest growing green economies in the nation, with an annual growth rate of over 10 percent (Muro, Rothwell, and Saha 2011). However, like Knoxville, much of this growth is occurring without public knowledge or deliberation (Airo et al. 2009). Little Rock's lack of civil engagement is steeped in its history of contentious race relations, which are often characterized as coming to a head with the 1957 desegregation crisis at Central High School (Anderson 2007; Barth, Adams, and Hill 2015). Threatened by social instability and violence, business leaders partnered with government to safeguard economic development by limiting public participation in the political process through a variety of tactics like the implementation of a poll tax (Anderson 2004). Although, starting in the 1990s, Little Rock governance has undergone substantial institutional reform to address exclusion, the political system remains dominated by business interests (see Barth, Adams, and Hill 2015).

While Little Rock has a diverse economic base centered on information technology, aerospace, healthcare, and military, its manufacturing industry is especially robust, contributing to its ranking as second in the nation for green exports (see Metro Litte Rock 2013, 2014; Muro, Rothwell, and Saha 2011). The Little Rock area offers several lucrative incentives ranging from tax credits to workforce development programs, which have successfully enticed manufacturing firms and grown the area's green technopole (see Little Rock Regional Chamber of Commerce 2016; Metro Little Rock Alliance 2016). Green growth is also driven by Little Rock's hub of global nonprofit headquarters, which includes firms like the William J. Clinton Foundation, Heifer

International, and Winrock International. Little Rock has a long history of nonprofit organizations working alongside the City to drive development (see Anderson 2004; Blair and Barth 2005). However, unlike industry-driven growth, the work of Little Rock's nonprofits more closely resembles green localism, especially in agriculture. The City, despite its historical ties to business, has also made localist-like gains. Such gains are most recognizable in waste management and construction but also in transportation. See Appendix P for a timeline of Little Rock's green economy development.

Little Rock's green technopole

In the last 15 years, Arkansas has sought to reinvent itself as an innovative knowledge-base economy (National Research Council 2012). Although state efforts to boost innovation can be traced back to the 1980s with the establishment of the Arkansas Science and Technology Authority and the Arkansas Development Finance Authority, both of which are based in Little Rock and offer financial incentives to business, its technopole did not witness high growth until the early 2000s (Allen 2012). Much of this growth has occurred in Little Rock, Arkansas's capital. Little Rock's high-tech entrepreneurial scene has recently earned several accolades, ranking as one of Forbes's "Best Places for Business and Careers" (Metro Little Rock 2013), as well as sixth best mid-size city for jobs and one of the "Best Performing Cities" in the nation (Metro Little Rock 2013). There are several factors contributing to the City's high-tech growth, including its "low cost of doing business, a large, mobile workforce, affordable skilled workers, good value for wages, aggressive tax incentives, easy access to port, [and] rail and shipping routes" (Metro Little Rock 2013). However, the recent and strategic efforts

of key actors, especially those working in the area's non-profit and education sectors, are also crucial to driving growth.

In the last few years, three key initiatives launched by area nonprofit organizations have greatly contributed to Little Rock's innovative industry. In 2008, Innovate Arkansas (2016) was initiated to "accelerate business growth for tech-based startups and established corporations in Arkansas." Funded by the Arkansas Economic Development Commission and administered by Winrock International, Innovate Arkansas (2016) has helped over 100 startup companies, created more than 100 jobs, generated $226 million in revenue, and raised $264 million in private investment. In 2012, Winrock International also began its Ark Challenge (2016) initiative, which is a mentorship-driven accelerator program that offers $50,000 and intensive consultation in exchange for six percent equity. Also in 2012, the Clinton Foundation, in collaboration with the Little Rock Regional Chamber of Commerce, launched Noble Impact (2016), an "education initiative that exposes students to relevant experiences and tools that enable them to navigate a world defined by uncertainty with an entrepreneurial skillset and a public service mindset." The program provides students with coursework that encourages creativity, connects them with local businesses, and fosters professional development (Noble Impact 2016). It is being implemented in schools across the state (Carter 2014a) and currently serves over 500 students (Noble Impact 2016).

The Little Rock Regional Chamber of Commerce has two additional initiatives that are poised to drive area innovation. The Venture Center (2016a), brainchild of local entrepreneurs Mike Steely and Lee Watson, was founded in 2014, is operated out of the Chamber and provides mentorship and technical support for local startup companies.

Since it's founding, the Center (2016a) has supported the creation of 153 regional jobs and raised $6.78 million in investments. In addition to business acceleration, the Venture Center (2016b) hosts several community programs, including 1 Million Cups, which is a networking event for local entrepreneurs, as well as Pitch 'N' Pint, which is a fast-paced competition for entrepreneurs to deliver a pitch to judges and a crowd. The Little Rock Regional Chamber of Commerce, along with the University of Arkansas at Little Rock (UALR), the University of Arkansas for Medical Sciences (UAMS), and other members of the Little Rock Technology Park Authority, are working to establish the $22 million Little Rock Technology Park (2016) downtown in order to create "an environment serving technology organizations in Central Arkansas." The Park, still being developed, is the region's first technology park and is anticipated to be a major economic driver (Little Rock Regional Chamber of Commerce 2016). According to Brent Birch, Executive Director of the Little Rock Technology Park:

> This is a crucial time for Little Rock and for technology. First-class facilities and programming at the Main Street home of the Little Rock Technology Park will be a catalyst for our local tech talent to succeed and advance. The strides we are making in this industry broaden the already diverse Central Arkansas economy and are instrumental in Little Rock's growth. The time is now and our region is positioned to be bullish towards opportunity in the tech industry, not just regionally, but globally. (Little Rock Regional Chamber of Commerce 2016)

There are several other organizations instrumental in driving Little Rock's technopole. Established in 2013 by State representative Warwick Sabin, the Arkansas Regional Innovation Hub (2016) offers local innovators access to cutting-edge equipment like 3D printers and advanced computer technology, as well as collaborative workspace

for local startups and an arts and design studio staffed with experts. Via a $575,000 grant from the Arkansas Economic Development Commission, the hub also features the Argenta Innovation Center, which entails renovating the old City police station to create the Launch Pad that will feature innovative technology (Carter 2014b). A $250,000 Delta Regional grant for program administration also supports the Hub (Carter 2014b), as well as a $1 million EDA grant to complete The Silver Mine, an entrepreneur resource center for local startups (Agricultural Council of Arkansas 2013). Regional innovation is also bolstered by UAMS and URLA, which jointly spend over $240 million annually on research and development (National Research Council 2014), as well as a variety of primary and secondary institutions that provide STEM-based education, such as the Forest Heights STEM Academy, Dunbar Gifted and Talented Magnet School, Carver Math-Science Magnet Elementary schools, and more (see Little Rock Regional Chamber of Commerce 2016). Also, in 2010, the Arkansas STEM Coalition (2015), a statewide partnership, was established to encourage, coordinate, and advocate policies, strategies, and programs to support STEM education.

Little Rock's green localism

Like the other cases, Little Rock's agricultural industry most closely resembles public-driven green localism. The Central Arkansas food movement is rapidly growing, boasting over 60 community gardens and urban farms, as well as an increasing number of businesses that serve local food (Boil Down Juice 2013a; c.f., Heady 2015). When the Arkansas Sustainability Network, Little Rock's food and farm coordinating program, was established in 2006 by grassroots advocates, there were only seven community gardens and the Little Rock Farmers' Market, which was comprised mostly of resellers (Boiled

Down Juice 2013a). The region now has six farmers' markets, all of which predominately feature vendors that grow or make products locally (Neel 2016). In 2007, the Arkansas Sustainability Network also launched the City's first and only online, all-year market, called the Certified Arkansas Farmers' Market (n.d.), which has no membership fee and accepts Supplemental Nutrition Assistance Program benefits. Prominent businesses that source local food include: The Root Café (n.d.), which also hosts a "range of activities from workshops, classes, and speakers to music events, hot-pepper-eating and beard-growing contests;" the Green Corner Store (2012), Arkansas's first and only eco-lifestyle food and retail outlet; and, Little Rock Urban Farming (n.d.), a farm incubator that also offers community supported agriculture. The area also hosts a variety of "food meetups" for Arkansans interested in "creating, supporting, or participating in local food markets" (McGeeney 2016), including most recently a small-scale network of gleaners that give to local food banks (Boiled Down Juice 2013b).

Heifer and Winrock International, two prominent international nonprofit organizations headquartered in Little Rock are also pushing forward localist agricultural development. Located within the City, Heifer Village, established in 2003, offers "programs and events throughout the year for school groups, families, or just anyone who wants to drop in and learn about world hunger" (Heifer International 2016a). In addition to its local village and a variety of international programs, Heifer International (n.d.) also hosts its Heifer USA program, which works to revive local food systems in Arkansas by "creating new employment opportunities and increasing the availability of nutritious, sustainably grown foods." Winrock International (2016a), with its mission to "empower the disadvantaged, increase economic opportunity, and sustain natural resources," also

offers a variety of localist agricultural initiatives. Launched in 2014, its Farmers' Market Promotion program provides new and emergent farmers' markets with consultation on topics ranging from marketing to vendor recruitment (Winrock International 2016b). The organization also offers a variety of entrepreneur assistance programs, many of which target women and minorities, as well as educational seminars, workshops, and conferences (Winrock International 2016c). Little Rock is home to several other nonprofit organizations working to support local agriculture, including, for example: Alliance for a Healthier Generation, the University of Arkansas at Little Rock's Cooperative Extension, Arkansas Women and Agriculture, and the Central Arkansas New Agrarian Society.

The City too is working with area nonprofits and grassroots activists to boost local agriculture. In 2011, the City sponsored Little Rock's Healthy Food and Active Living Summit. The Summit brought together local and national leaders to "connect and explore a shared vision for providing equal access to healthy foods and active living" (City of Little Rock 2011a). Also in 2011, the City's Sustainability Commission, a group of volunteer citizens appointed by the Mayor in 2008, adopted rules and regulations for City farmers' markets to ensure safety and sanitation (see City of Little Rock 2015b). In 2013, the City in partnership with the Little Rock School District, Heifer International, Arkansas Hunger Relief Alliance, and others were awarded a $100,000 Bloomberg Philanthropies grant to launch a comprehensive school-based childhood obesity initiative, which entailed nutrition curriculum and the construction of over 300 gardens on school campuses (City of Little Rock 2013). Additionally, the City, along with Arkansas Hunger

Relief Alliance, is working to develop a mobile food market program that will deliver fresh produce to residents in local food deserts (City of Little Rock 2016a).

Little Rock's city-led growth

The City is also leading efforts in green localism, particularly in waste management, construction, and transportation. In 2012, the City of Little Rock partnered with WMI to expand its existing recycling program by offering residents single-stream recycling. The City also offered Recyclebank (2016), which enabled residents to earned points towards discounts on groceries, apparel, merchandise, and more. Two months after implementation, participation jumped from 32 percent to an astounding 92 percent (Poe 2012), and in 2013, residents recycled 18,010 tons of aluminum, cardboard, metal, plastics, and glass (Regional Recycling and Waste Reduction District 2016). Given the success of the program, in 2014 the City expanded and adopted multifamily single-stream recycling, mandating that complexes with over 100 units provide recycling (City of Little Rock 2015c). The ordinance covered about 83 percent of City apartments (Brantly 2014). Pulaski County also offers several drop-off centers for residents outside City limits. Additionally, in 2015 the University of Arkansas for Medical Sciences partnered with Organix, a local organic waste recycling company, to launch a composting pilot program. The program has been quite successful, donating over 12 tons of food waste in its first six months (Hogan 2016). Nearby hospitals and businesses have expressed interested in replicating the program, and the City is also considering launching their own composting program (Walkenhorst 2016).

The City of Little Rock also has several initiatives that have long been driving green construction. In 2005, the City adopted a resolution mandating that all new

constructions and major renovations be built to LEED standards or another nationally recognized rating system (Green Policy 360.net 2005). Although the City's first LEED-certified building, the $12.5 million 12th Street Police Station, was not constructed until 2015 (Boozer 2015), in the interim, several other organizations followed its lead and built to LEED standards, including the Clinton Presidential Center, the first LEED-certified building in the state (Clinton Foundation 2014), and Winrock International Headquarters, the state's first LEED-Gold certified building (Winrock International 2016d). In 2009, via a DOE $1.9 million Energy Efficiency and Conservation Block Grant, the City launched its Green Building Incentive Program (Irvin 2011), which offered up to $1,500 per qualified project (City of Little Rock 2009). In 2014, the City adopted the 2009 International Energy Conservation Code, which established minimum energy requirements for new constructions (City of Little Rock 2015d). Most recently, the City established a property-assessed clean energy (PACE) program, granting property owners access to low-cost, long-term financing for energy efficiency and renewable energy projects (Arkansas Advanced Energy Association 2015).

Little Rock is also home to several eco-districts. In 2011, the City won a $150,000 National Endowment for the Arts grant to spur creative placemaking along Main Street by "using smart design and leveraging the arts to enhance quality of life" (City of Little Rock 2011b) Coined the Creative Corridor, the project spurred investment, including: a $900,000 EPA grant for a water quality demonstration site (City of Little Rock 2012); a $460,000 award from the Arkansas Highway and Transportation Department for bike lanes (Lauer 2013); a $345,000 ArtPlace America Grant to enhance the streetscape (City of Little Rock 2014a); the establishment of the $22 million Little Rock Technology Park

(King 2015); and, over $112 million in private development commitments (Boozer 2015). Mayor Mark Stodola lauded the development, stating:

> This is the project that developers have known was going to take place. It is the primary catalyst for north Main Street's recent economic development. If you walked down Main Street last year, you saw that it was very different from its hay day when stores were bustling with activity. Projects like this one are what is going to revive the very heart of Arkansas- Main Street Little Rock. (City of Little Rock 2014b)

The project has won several awards, including the 2014 Honor Award from the American Institute of Architects (City of Little Rock 2014c) and the American Council of Engineering Companies' 2016 Engineering Excellence Award (City of Little Rock 2016b). Other notable eco-districts include Rock Street Pocket Housing, a City-funded affordable and green housing project that in 2013 received an Honor Award for Regional and Urban Design from the American Institute of Architecture (Pettaway Neighborhood Association 2013; Waldon 2013), and Woodland's Edge, a 780-acre parcel, which became the nation's first four-start rated community under the National Green Building Standard (Binsacca 2010). The private development was named the National Association of Home Builder's 2009 Green Development of the Year and also earned the first American Trails Developer Award (Binsacca 2010).

Although the City is clearly a leader in green construction, several other local organizations have been instrumental in growing the industry. The Home Builders Association of Greater Little Rock (HBAGLR 2016), for example, in 2008 established the state's first comprehensive green building program, Green Built Arkansas. In 2009, HBAGLR (2011) built a model home to the program's standards on Woodland's Edge and hosted a series of seminars to highlight its green aspects. In 2010, Pulaski Technical

College won a $1.2 million stimulus grant to develop new courses and certifications in green construction, such as in energy auditing, weatherization, and heating-and-cooling system maintenance (Krupa 2010). Additionally, Entergy, the City's local energy provider, offers a variety of energy efficiency programs that incentivize energy audits, Energy Star home construction, weatherization, and more (Smith 2010; Will 2012). So too does the Arkansas Electric Cooperative Corp. (AECC), which is an association of Arkansas's 17 electric distribution cooperatives and is based in Little Rock. AECC (2014) is one of the top generation and transmission cooperatives in the nation and offers several resources for energy conservation, including it annual Energy Efficiency Makeover, which awards one customer in each cooperative $5,000 in efficiency improvements.

The City's localist-like efforts are also visible in transportation. Little Rock has increasingly shown commitment to active transportation, evident first by its investment in the Arkansas River Trail, but also by its recent complete streets policy. The 2015 ordinance calls for "the development of safe, reliable, efficient, integrated and connected multimodal transportation system that ensures the safety of all anticipated users, including pedestrians, bicyclists, public transportation users, persons with disabilities, freight haulers, and motorists" (City of Little Rock 2016c). The ordinance was recommended by the City's Bike Friendly Community Committee, which was established in 2007 to encourage citywide bicycle use (City of Little Rock 2015e). Although the fruits of the ordinance are yet to be realized, the Smart Growth America's National Complete Streets Coalition recognized the policy as the eight best in the nation (City of Little Rock 2016c). In 2014, the City also opened a $1.3 million compressed

natural gas (CNG) fueling station (Boozer 2014). The public station was funded in part by a $235,000 Arkansas Energy Department and $100,000 Southwestern Energy grant, and is expected to reduce the City's fuel budget by $200,000 over the next 18 months (Arkansas Matters 2014; Clinton 2014). The City has long owned CNG vehicles but plans to purchase an addition 25 in order to meet its goal of increasing its CNG fleet by 20 percent (Arkansas Matters 2014).

As part of the CNG movement, Rock Regional Metro, Central Arkansas's public transit system, is set to receive 15 new CNG buses (Oman 2015). The entire fleet is also to be equipped with free Wi-Fi and provide real-time passenger information via a GPS-based mobile app, called Metro Tracker (Oman 2015). These upgrades are the result of a $600,000 grant from Metroplan, the region's designated metropolitan planning organization (Oman 2015). Both Rock Regional Metro and Metroplan have recently adopted plans to green area transportation. As a result of one year's worth of public input and strategic planning, Rock Regional Metro (2016) adopted its 2015 *MOVE Central Arkansas* plan, which entailed a .25-percent sales tax increase to deploy bus rapid transit, along with improved bus routes, flex zones, community shuttles, and more. In 2011, Metroplan released its *Central Arkansas Green Agenda*, which suggested four focus areas, 13 strategies, and 106 action items (Moore and Bell 2011). The report provided a blueprint for sustainable transit, calling for a reduction in the region's car dependency, improvements in energy efficiency, greater protection of the area's eco-systems, and increased public awareness (Moore and Bell 2011).

Despite Little Rock's robust and diverse green economy, sustainability is still in its infancy. This is especially evident in the City, which lacks an official department of

sustainability and a central website to showcase its green efforts. Additionally, local green initiatives are uncoordinated and often unpublicized, making it difficult to find information on the numerous efforts (c.f., Airo et al. 2009). Local green initiatives are largely rendered invisible (c.f., Airo et al. 2009). The City also lacks a comprehensive sustainability plan. However, the Little Rock Sustainability Commission, established in 2008 by Mayor Mark Stodola, is working to rectify the deficiency. At the City's sixth annual Sustainability Summit, participants drafted the *Sustainability Roadmap to 2020*, which identified 17 action items (City of Little Rock 2015f; Walkenhorst 2015). The Sustainability Commission is currently working out the details for implementation, which it hopes to complete by 2020 (see City of Little Rock 2016d).

Conclusion: Growth Configurations and Shades of Success

The bulk of this chapter provided an overview of four U.S. cities with vibrant green economies, with a particular focus on the institutions and actors driving the green transition. Each case, however, varied considerably both in terms of defining characteristics and outcomes. In terms of characteristics, landscapes (i.e., demographics, macroeconomics, socio-political culture, and environment) were especially variable. In Austin, for example, rapid population growth, coupled with the City's location on top of the Edwards Aquifer, put considerable pressure to expand City services, particularly transportation, while protecting the City's only water supply. Although there was consistency across cases in terms of incumbent regime actors (i.e., those historically dominant) and niche-innovators (i.e., creative and novel entrants), their roles and power varied, forming unique configurations and outcomes. For example, in Knoxville, the City and USGBC were largely driving green construction standards, whereas in Little Rock,

the Home Builders Association of Greater Little Rock, along with strong City support, was leading the way. The remainder of this chapter provides a review of the four cases, comparing and contrasting their defining features in terms of the four propositions presented in Chapters 3 and 4. Recall the propositions:

1. Green economies share similar pressure from niche-innovators and the landscape, although effects are more variable at the local level.
2. Green economies share similar configurations of regime and niche actors, although they differ by power.
3. Development pathways vary according to landscape, regime, and niche-innovation configurations.
4. Development pathways vary according to socio-environmental justice-related goals prioritized in projects within and between regime and niche actors.

Proposition 1: Green economies share similar pressure from niche-innovators and the landscape, although effects are more variable at the local level.

Overall, proposition one is supported. At the global or national level, all four cities experienced similar pressures from the landscape. The twin forces of neoliberal globalization and climate change put considerable pressure, particularly on governments, to foster socio-environmental innovation. As discussed in Chapter 1, such pressure prompted the U.S. government, along with several other nations, to offer stimulus funding, much of which was earmarked for green investments. ARRA created a political opening at the federal level, from which all four cities' green economies benefited. How such pressures and opportunities manifested on the local or regional level, however, different considerably by case. In both Knoxville and Little Rock, stimulus funds

jumpstarted their green economies. Although for Knoxville, the City already had a sustainability plan that mapped out deficiencies and provided recommendations, many of which ARRA funded. Little Rock, conversely, had no such plan, and instead relied on partnerships with area businesses to attract ARRA funding. Four years post-ARRA, the City of Little Rock is now working on a comprehensive sustainability plan. Chicago and Austin's green economies both have much longer histories, and although impacted by ARRA, they had already developed alternative funding strategies.[31] Thus, the progress made with stimulus funding was far less visible than it was in Knoxville and Little Rock.

For each city, the local or regional landscape itself also created case-specific pressures and opportunities. Table A.8 presented at the beginning of this chapter is instructive. Demographics were particularly formative in Chicago and to a lesser extent Austin. With Chicago being one of the most segregated U.S. cities, green investments often occurred first in wealthier and whiter neighborhoods. Civic leaders have had considerable success in alleviating such injustice, perhaps most notably in waste management. Austin too has a history of environmental justice movements, which manifested most clearly in the conflicts over HausBar Farm and urban commercial farming. Also, Austin's high population growth was especially taxing on City services

[31] In Chicago, Mayor Daley utilized the City's TIF fund, which was created in 1977 but not broadly used until his administration. Daley, known for his grand and over budget projects (e.g., Millennial Park), also famously sold off public assets like parking meters and spaces and left a budget deficit of over $500 million (Johnson 2011). More recently, Mayor Emanuel created the Chicago Infrastructure Trust to fund transformative infrastructure projects. In Austin, the City has a long history of funding public projects with municipal bonds, dating as far back to 1928 when voters approved its use to build Austin's first airport (Mueller Redevelopment 2016b).

and the environment, problems with which it continues to struggle. Perhaps because all three are located in the south, Austin, Little Rock, and Knoxville's macro-economies were business-friendly, offering a low-tax environment and a low-wage workforce. Austin, however, differs in that cost of living is much higher, and with nearly half of its population having a bachelor's degree or higher, it also offered a high-skilled workforce. As far as culture, all four cities enjoyed a robust creative class. However, Knoxville's politics, with over two-thirds of voters registered as Republican, were much more conservative than those in other cities. This was especially apparent in Knoxville's early green growth when City leaders felt unable to talk about sustainability. Lastly, the natural environment itself creates pressures and opportunities. For example, all four cities were particularly apt for solar generation, but wind was well suited only in Chicago and Little Rock. Likewise, Chicago, with its proximity to the Great Lakes, and Austin, sitting atop the Edwards Aquifer, grappled with water management, which was not the case in Knoxville or Little Rock.

For all four cases, pressure from niche-innovators was much harder to identify. Although each city had protected spaces, such as incubation labs and technology parks, innovators tended less to challenge regime leaders but instead work collaboratively. There were exceptions. In Chicago, for example, innovations in urban agriculture, such as vertical gardening, aquaponics, and rooftop greenhouses, are changing the way residents think about food. However, many of those innovations are occurring in Chicago's food deserts where there is not a strong industrial agricultural presence to resist the change. As Chicago's urban food revolution continues to attract commercial interests, this may change. In the case of TVA and Austin Energy, both quasi-governmental utility

providers, niche-innovation is also driving change. Perhaps because of their unique organizational forms, they were more experimental than ComEd or Entergy in their green energy incentive programs. Both also engaged in countervailing industry mobilization, partnering with local innovators to help develop advanced technologies (see Hess 2014). Also in Austin, as the key contributor to high population growth, innovation in the City's green technopole is pushing forward a green transition, albeit indirectly.

Proposition 2: Green economies share similar configurations of regime and niche actors, although they differ by power.

To a large extent, proposition two is also supported. Each city's green economy did share several similar actors, and their relationships did differ by power. However, there were considerable differences. Appendix Q depicts the major actors in the agriculture, construction, waste management, transportation, and research commercialization stakeholder groups in each city. Government was present in all groups. That government was so active lends support for Block (2008) and other's (Block and Keller 2011; Mazacuto 2014) work on the hidden developmental or entrepreneurial state. In Knoxville, however, the City was the chief driver of sustainability in all groups outside agriculture and the technopole. In Little Rock, large nonprofit organizations joined the City in driving growth. And, while in Chicago the City tended to work with political, business, and civil elites, coalitions primarily drove green growth in Austin. Even in instances where city government was not the principal actor behind growth, its participation was often necessary to draft new policies or regulations. Also across cases, area chamber of commerce and community colleges played quintessential roles in

workforce development, although the programs emphasis often depended on the strengths in its technopole.

Across cases, agriculture was the only industry driven by green localism. In each case, a food policy council that guided research and crafted policy recommendations was present, as well as a university-operated extension office, which provided public education and community outreach. Short of Little Rock, each case also had an active permaculture guild that provided networking events and educational support. While in Knoxville and Little Rock, agriculture was the only example of green localism, in Austin every industry outside the technopole was public-driven. Across Austin's stakeholder groups, coalitions, particularly of residents and nonprofit organizations, are more pronounced than in the other case. In Austin's agriculture stakeholder group, too many coalitions exist to list, ranging from advocacy groups to recycling nonprofits to citizen organizations. In Chicago, localist movements heavily shaped waste management, along with agriculture. While coalitions in the waste management stakeholder group mobilized against City corruption and the disproportionate burden placed on low-income minority groups, agricultural stakeholders mobilized to combat food insecurity and the intercity decay wrought by deindustrialization.

Also across cases, utilities and the USGBC played important roles in greening the construction industry. Although utilities in all cases provided important incentives for energy conservation, whether, for example, via Energy Star rebates or weatherization services, as discussed above, Austin Energy and TVA's roles were much stronger. Each city also housed a USGBC chapter, although in Austin and Knoxville, it was a regional rather than state chapter. Because the USGBC is a national organization, it offered

similar programs in each city, such as its Green Lights Awards, Apple Day of Service, and Green Schools Initiative. However, it played a larger role in Knoxville, which was struggling to implement the 2012 International Green Building code, as well as in Chicago, which offered several incentives for building to LEED standards. In Little Rock, the HBAGLR spearheaded green construction standards, much like the Austin Energy Green Buildings programs in Austin.

Every city also had a robust green technopole driven in part by large research universities, as well as a chamber of commerce. Chambers played similar roles, supporting area industry through workforce development, regional economic partnerships, and the promotion of targeted growth. Each aligned its agenda largely with that of its technopole and offered regional planning, including initiatives like Knoxville's Innovation Valley or Innovate Austin. Each case included at least one large university, which had an extensive support system that consisted of nonprofit organizations dedicated to technology transfer, startup support, incubation, mentorship, and more. Also in each case, the chamber had either launched or heavily supported a high-tech startup or entrepreneurial support center. In the case of Austin, however, several corporate-led laboratories also bolstered university-driven research. To an extent, this is true of Chicago as well. Oak Ridge National Laboratory and its accompanying DOE office benefited Knoxville's technopole. While Chicago too benefited from Argon National Laboratory, the lab is located outside of the City and was not as impactful. Magnet and charter STEM-based schools, across cases, also played an important role in workforce development by providing early education and career paths for high school students, and in Austin and Chicago, for students as young as preschoolers.

City government largely drove green growth in the transportation and waste management industries. Austin, as to be expected, was an exception, but even with such public-driven growth, the City played an important role. In transportation, city-owned Capital Metro provided the bulk of Austin's public transportation, and the City contracted with Balcon Resources to provide recycling services. Greening efforts within these two stakeholder groups, however, were largely shaped by civic organizations like Austin Rail Now or Austin Zero Waste Alliance. Likewise Chicago's waste management industry was an exception. As previously discussed, environmental justice groups largely paved the way for green waste management. Across cases, however, county governments played an important role in providing drop-off recycling centers for residents outside city limits. Additionally, every city transportation department had a corresponding metropolitan planning organization, primarily centered on transportation, as mandated by the 1962 Federal-Aid Highway Act. Except for Little Rock, each case also had a city-initiated regional planning organization focused primarily on transportation.

Proposition 3: Development pathways vary according to landscape, regime, and niche-innovation configurations.

In terms of the technopole, proposition three is largely unsupported. Across cases, each city's green technopole most closely resembles Geels and Schort's (2007) de-alignment-realignment socio-technical transition pathway. At the global and national level, considerable pressure from neoliberal globalization and climate change prompted the federal government to administer stimulus funding. Such funding was critical in launching greening initiatives in Knoxville and Little Rock. However, in Austin and Chicago, both large cities with a history of mobilized publics, the green transition was

already underway. Nonetheless, in all four cities, with niche-innovations largely being underdevelopment, ARRA spurred investment in high-tech projects, causing a proliferation of competing technologies. Perhaps the exception would be in the case of TVA and Austin Energy, which may more closely resemble the reconfiguration pathway. As discussed previously, both utilities invested heavily and adopted experimental policies and technologies in an attempt to adjust to pressures from the landscape and niche-innovators. However, short of smart grid technology, most other technologies (e.g., micro-grids and batteries) are still underdeveloped, and so perhaps their trajectory is still best understood as the de-alignment-realignment pathway.

Except for Austin, which is unique in its history of activism across stakeholder groups, all cases witnessed city-led green growth. This lends credence to my claim in Chapter 4 that an additional pathway may need to be added to Geels and Schorts (2007), as well as Hess's (2010), typologies of sustainability transitions. In Knoxville and Little Rock, city government led the transition in every industry except research commercialization and agriculture. However, in Little Rock, the City relied heavily on partnerships with nonprofit organizations. Because much nonprofit-driven, localist-like green growth did occur outside both City and public efforts, an additional nonprofit-led pathway may be warranted. A more in-depth analysis is needed. In Chicago, we also see city-led growth, most noticeably in the construction and transportation industry.

Lastly, there is some variation in the way in which green localist efforts manifest into development pathways, lending some support for proposition three. This is most apparent in Chicago's agriculture and waste management industries. In agriculture where civic groups mobilized around issues of food access, green localism most closely

resembles an access movement. However, as the movement has progressed and urban agricultural techniques advanced, it is beginning to resemble an alternative industry movement. As mentioned above, advanced techniques like vertical gardens and rooftop greenhouses are starting to change how residents view their relationship to food, thus posing a real alternative to industrial agriculture. Efforts in Chicago's waste management industry may also be best understood as an access movement, but conversely because civic groups mobilized against the disproportionate number of landfills and superfund sites located in poor and minority neighborhoods. In Austin, with perhaps the exception of its agricultural industry, which with the HausBar Farm conflict has elements of an access movement, most civic efforts most closely resemble an alternative industry movement. In construction, the Austin Energy Green Building program provides alternative building standards. In waste management, the [re]manufacturing hub offers an alternative to conventional recycling or landfilling. And, while green transportation in Austin is still underdeveloped, the City, as prompted by several civic groups, is exploring ways to reduce its car-dependency and improve its public transportation system.

Proposition 4: Development pathways vary according to socio-environmental justice-related goals prioritized in projects within and between regime and niche actors.

Overall, proposition four is supported. Development pathways do vary according to the socio-environmental justice-related goals prioritized by regime and niche actors. Across cases, actors in each city's technopole made clear that market alignments, not justice, were driving green investments. None of the interviewees working in Knoxville's technopole expressed opposition to socio-environmental justice, and likewise, across

cases, none of the techno-based archival materials analyzed expressed opposition. However, justice was rarely discussed as a motivator, a sentiment reflected in the fact that high-tech growth largely occurs among a subset of highly educated researchers and engineers. Green is seen as another road to profit. This was most obvious in Knoxville's green economy where, largely due to ORNL and UT researchers, less than 40 percent of its jobs are green-collared (see Muro, Rothwell, and Saha 2011). The case can be made that Knoxville's city-led growth, however, much like Little Rock's, was a community-based endeavor from the start. As discussed in Chapter 4, the 2007 establishment of Knoxville's Energy and Sustainability Taskforce was inherently about greening the community, and in Little Rock, the City's reliance on partnerships with nonprofit organizations greatly shaped its socio-environmental just-related efforts.

The impact of socio-environmental justice-related goals on development pathways, however, is much starker in Austin and to a lesser extent Chicago. Across cases, civic involvement in Austin is unparalleled. Although such large-scale public involvement has often thwarted progress, such as the case with the ongoing conflict over high-speed rail, such participation has resulted in a city shaped by the city. In Chicago, results are mixed. Under Mayor Daley, early City-led green growth started out as a beautification and redevelopment strategy and later morphed into a widespread master sustainability plan. Later efforts, especially under Mayor Emanuel, are more targeted at serving the City's disenfranchised. This is most apparent in his 2013 overhaul of the City's recycling program and recent initiatives to boost urban agriculture and address food access issues, such as with his *Green Healthy Neighborhoods* plan, which targets Chicago's poor south side. However, it is important to note that City efforts in both

industries are predated by a long history of often-contentious efforts on behalf of civic groups working for greater socio-environmental justice.

While this chapter provided a comparative analysis of four U.S. cities with recognized green economies, the next addresses the questions: So, what does this mean? What are the implications for policy? What insights can be gleaned for practitioners looking to guide a green transition? The next chapter also discusses theoretical contributions, examining how this research fits into the broader literature on sustainability transitions. Lastly, Chapter 6 addresses the limitations of this study and suggests directions for future research.

Chapter 6: Conclusion

In this research, I examined four U.S. cities with recognized green economies. Although each city enjoyed a vibrant green technopole and elements of green localism, the institutions and actors driving the green transitions formed unique configurations. Across cities, however, there was a common core group of actors, such as city government, large research universities, food policy councils, and others (i.e., see Appendix Q). Power dynamics between prominent actors, however, differed by case: the City and ORNL-UT-TVA nexus drove Knoxville's bifurcated green growth; in Austin, public coalitions worked alongside government; leadership was more variable in Chicago, with coalitions driving growth in agriculture and waste management and the City largely pushing forward the rest; and, in Little Rock, the City was also behind the green wave, although it relied heavily on partnerships with business. These unique configurations, along with pressures and opportunities within the landscapes, shaped each city's development. Although this was less true among technopoles, where high-tech products for export was consistently prioritized. Also across cases, actors working in the technopole made clear that market alignment was driving green growth. This was far less true for localist work, especially in agriculture where food access and security were often key motivators. Market alignment was also less important for city-led growth. However, in the case of Chicago and to a lesser extent Austin, city government was also active in the technopole.

So, what does this mean? The remainder of the chapter unpacks that question by first discussing limitations of the study and then contributions to scholarly literatures, including those on the green economy, sustainability transitions, and new state theory.

Then, I address implications for praxis and policy. I conclude by highlighting possible avenues for future work.

Limitations

The biggest limitation was the availability of data. The cases themselves were largely selected based on findings from the Brookings Institute's 2011 report *Sizing the Clean Economy: A National and Regional Green Jobs Assessment* (see Muro, Rothwell, and Saha 2011). The U.S. Bureau of Labor Statistics (BLS) (2013b) does, however, offer more recent data, having tracked green jobs from 2010 to 2013. Although the BLS data was considered in case selection, the Brooking's data was much more comprehensive, offering a more detailed snapshot of regional U.S. green economies. Although, the Brookings Institute's study was the result of a collaboration with Battelle Memorial Institute, which is a private nonprofit organization that manages several U.S. national laboratories. As a result, the study is heavily skewed towards high-tech energy innovation and less towards green localist activity. More up-to-date and comprehensive data would have allowed for other considerations in case selection. Nonetheless, the BLS data, as well as green awards and rankings from other independent organizations (e.g., Urban Land Institute, Grist, and the U.S. Green Business Council), enabled me to triangulate the Brookings' findings and select four distinct yet comparable U.S. cities with high-growth green economies.

Researching the Little Rock case, in particular, posed unique challenges. In the cases of Austin and Chicago, an abundance of research was published on each city's general history, as well as on local sustainability efforts. Although in Knoxville, entire books had not been written on the subjects, as was true for Austin and Chicago, the City

had a robust website that detailed many of its sustainability initiatives. Additionally, the Knoxville News Sentinel had an entire online section, *GoGreenET.com*, dedicated to area green efforts. The fieldwork, interviews, focus groups, and survey research were also informative and greatly eased the research process. Little Rock, however, lacked any central website that showcased green activity. The City had no department of sustainability or environment, and its website hardly discussed green efforts outside of recycling. Likewise, neither the *Arkansas Democratic Gazette* nor other news outlets picked up by a Google search published on local green achievements outside the occasional article. While the newspaper reports, as well as the City's meager web postings, were useful in identifying several green initiatives and events, more detailed information was commonly found in the reports published by local nonprofit organizations (e.g., Little Rock Regional Chamber and Winrock International). Researching the Little Rock case took at least twice that of the other cities, and because of these limitations, is still less comprehensive.

Contributions to Scholarly Literatures

As discussed in Chapters 1 and 2, the green economy literature is still in its infancy. There exists a multitude of conceptualizations, definitions, and measurements, which has contributed to non-cumulative research and the lack of knowledge about what a green economy is or how to transition to one (see Bar et al. 2012; Martinson, Stanczyk, and Eyster 2010; Wanner 2015). My research addresses this deficiency by providing an analysis of the extant literature and a typology of the varying shades of green economies (i.e., see Table A.1 presented in Chapter 2). I distinguish three shades. The least transformative are light green economies, which adhere to neoliberal economics,

technocentric change, and market justice (i.e., derived from individual innovation and free markets). Opposite are deep green economies, which are often based on ecological or steady state economics and argue for structural justice (i.e., collective behavior that alters the foundation of society). In between are moderate green economies, which promote a greening of capitalism that emphasizes the role of the state, egalitarian justice (i.e., emphasizes equality), and limits to growth. This typology is useful in understanding the various socio-environmental arguments for and against particular types of green transitions.

Also in Chapter 2, I offer a model for conceptualizing green economies. Presented in Figure A.1 is an embedded, multilevel representation for the green economy. The model is particularly useful for identifying the relationships between the landscape, regime actors, and niche-innovators. Both the landscape and niche-innovation levels are shown with arrows symbolizing pressure on the regime. Following Elzen and colleagues (2011), I adopted an embedded approach (Dacin et al. 1999) to conceptualize the regime. Regime actors are divided into two fields. The first is the task environment, which includes the producers and consumers that make up the supply and demand for green products, processes, and services. The other is the institutional environment, which consists of the policymakers and mobilized publics (e.g., labor unions and civil society) that provide regulatory and normative-cultural legitimacy to green economy activities. Figure 1 is also useful because it grounds an otherwise a-theoretical literature within transition theory.

Additionally, my research makes three important contributions to transition theory. First, it offers a comparative analysis of four U.S. cities to an otherwise national

and Euro-centric literature (see Hess 2014; Markard et al. 2012). Recall that transition theory is a set of interrelated theories first developed in the early 2000s by a group of largely Dutch scholars (van der Bruggee 2009). These scholars were mostly interested in the evolution of large-scale socio-technical systems within Nordic countries, such as the Netherland's national transportation system (see Geels 2012) or Dutch energy production (see Correlje and Verbong 2004). My research points to the importance of levels of analysis, and suggests that transition scholars pay closer attention to pressures and opportunities within and between the various levels. The Knoxville case is emblematic, illustrating how despite a relatively closed socio-political landscape at the regional level, an opening at the federal level (i.e., the 2008 American Reinvestment and Recovery Act) created opportunities for progressive leaders to push forward green initiatives. The in-depth case study analysis demonstrates how City leaders, largely by not publicizing green efforts and funding them with federal stimulus dollars, were able to depoliticize their work and start the green wave in Knoxville.

The other two important contributions include conceptual clarification of the landscape and further refinement of Geels and Schort's (2007), as well as Hess's (2010), typologies of sustainability transitions. As discussed in Chapter 5, the landscape has often been criticized as a "garbage can concept" that accounts for many and diverse contextual influences (see Geels 2011: 36). To help overcome this deficiency, I divided the landscape into four conceptual categories: demographics, macroeconomics, socio-political culture, and the environment. In Table A.8, I also offered indicators for each category. Although further refinement is needed, I demonstrate how the landscape can be developed into a more robust and operationalized concept. Additionally, my research

contributes to transition scholars' understandings of sustainability transitions by offering a ninth pathway, which is city-led green growth. Although Geels and Schort's (2007) typology offers five distinct pathways for sustainability transitions, its socio-technical focus is at the expense of localist-led growth. Hess's (2010) typology of green localist movements, although addressing this hole, likewise does not account for the city-led development observed in three of my four case studies. City-led green growth was most pronounced in Knoxville, but was also salient in Chicago and Little Rock. Austin was the exception, but even amongst its coalition-driven green growth, the City played an important and crucial role (e.g., policy and regulation).

Lastly, this study contributes to the literature on new state theory. My work strongly supports Block (2008) and others' (Block and Keller 2011; Mazzucuto 2014) research on the hidden developmental or entrepreneurial state. Not only was federal stimulus money instrumental in furthering green development in all four cases, but in Knoxville and Little Rock, it also provided the necessary funding to jumpstart their green waves. Also, federal institutions, such as the Department of Energy and Oak Ridge National Laboratory, and even quasi-governmental organizations like the Tennessee Valley Authority, were important institutional actors in guiding a green transition. My research also adds to this literature. Much like transition theory, new state theory has a national and socio-technical bias. Research has tended to focus on the nation-state's active, but due to the prominence of neoliberal globalization also hidden, role in high-tech innovation. This research illustrates how city governments too can play an active and sometimes hidden role in not just technological but also social innovation. The Knoxville case in particular illustrated how City government operating in a closed political

landscape worked rather elusively at first to green its own operations and services and later to instill green values in its publics. The need to be covert was less of an issue in Little Rock and Chicago, and in Austin, the City's relationship with its mobilized publics was so intimate that the work of each was virtually indistinguishable.

Implications for Praxis and Policy

In terms of praxis and policy, there are several insights to glean from the four cases examined in this study. One of the more salient findings is the importance of understanding the landscape in which the city operates. Across cases, the success of green initiatives was heavily dependent upon how actors and institutions were able to maneuver pressures and seize opportunities within the landscape. The case of Knoxville is particularly instructive. Green economy leaders operating amidst Knoxville's regional landscape were challenged by, for example, its Appalachian culture, Republican voter-base, low-wage business climate, and opposition to tax increases. This is despite the area hosting a large group of green economy actors who boast a strong environmental identity. Nearly all survey respondents (98.36 percent), for example, reported caring about their environmental impact, and nearly 70 percent (66.39 percent) identified as an environmentalist. Furthermore, most respondents expressed support for green change. Over 70 percent of respondents (72.73 percent), for example, admitted making significant changes in their lifestyle for environmental reasons, and nearly 80 percent identified with governments and nonprofit organizations (78.51 and 84.30 percent, respectively) working to promote environmentalism. Despite such pro-environmental attitudes, only by understanding their landscape were leaders able to depoliticize their green acts and capitalize on emergent opportunities at the federal level. This stands in sharp contrast to

Austin where mobilized publics are at the heart of the green wave, which further illustrates the importance of understanding landscape characteristics.

Also consistent across cases were pitfalls from creating and maintaining a favorable business climate. Since the advent of deindustrialization, industry has increasingly located in the south where regulations, taxes, and wages are historically low. Organized labor is also considerably weak, which many right-to-work southern states proudly boast. In Knoxville, especially, the lack of secure and well-paying jobs has left residents with median household incomes far below the national average. In Austin and Little Rock, progressive leaders have been more successful in growing well-paying green-collared jobs. While in Little Rock, manufactures like L'Oreal and Caterpillar, although neither is unionized, offered good-paying jobs, in Austin, civic coalitions have pushed forward several policies to improve working standards (e.g., voting to raise citywide minimum wage to $13.03 per hour). Chicago, once known for its heavily unionized manufacturing industries, has also taken a hit from deindustrialization and forced to grapple with the rise of insecure, low-wage jobs. Whereas business in Little Rock and civic coalitions in Austin have made strides, in Chicago, the City is taking the lead on initiatives ranging from addressing brain-drain via "ThinkChicago: Lollapalooza" to industrial rezoning in the historically depressed Calumet neighborhood. Such case studies demonstrate that in a green (re)development strategy, the creation of good paying jobs is critical, and that in the absence of organized labor, other actors, whether business, civic organizations, or city government, are necessary proxies.

Although perhaps unsurprisingly, across cases, lack of funding posed challenges to green initiatives. This was especially problematic in Knoxville where residents

consistently vote down attempts to raise taxes for increased public services. Perhaps due to size and southern culture, the City of Little Rock too has funding difficulties and has often relied on philanthropy from its large nonprofit organizations and businesses. In Chicago and Austin, however, this was less of a barrier. Both have much longer histories of green growth than Knoxville and Little Rock and had developed alternative and creative funding mechanism. The use of tax increment financing or municipal bonds, for example, has been especially useful in setting up pilot programs that allowed for experimentation with green initiatives prior to large-scale deployment (e.g., composting in Austin or green alleys in Chicago). Without such funding mechanism and experimentation with pilots, many of Austin and Chicago's most successful green initiatives would not have been possible. Although we see city leaders in Knoxville making up for this deficiency via an impressive history of grant-winning, as well as large nonprofits funding small-scale programs in Little Rock, neither offered the security of that provided by Austin and Chicago's alternative funding strategies. Of course, it is not just funding but the funding of smart green strategies that provide life-sustaining programs that is important.

Finally, the case studies demonstrate the importance of inclusive and collaborative growth. Growing a robust green economy takes every sector and, more often than not, cross-sector collaboration. As Rogers (2013) stated, its best thought of as the greening of the entire economy. Perhaps no partner is more important than city government, which was instrumental in guiding a green transition across cases. Whether that be in Knoxville, where government leaders were driving growth, or in Austin, where civic coalitions primarily depended on government for regulation and policy

development. In Chicago and Little Rock, city government's role was more variable depending on the sector but fundamental nonetheless. Another takeaway is the importance of civic engagement. Austin may be an exemplar, but the Knoxville case is also instructive. Although City officials were able to quite successfully launch a green wave without public engagement, as a result, large numbers of the population were barred from participation. The City's quiet work, coupled with the lack of green-collared jobs, rendered Knoxville's green economy and its benefits largely invisible to its public. This is starting to change, especially with such high-profile projects like the Knoxville Extreme Energy Makeover, which will weatherize approximately 1,200 low-income homes, and the Institute for Advanced Manufacturing Innovation, which is expected turn the area into an advanced manufacturing hub. Although the Knoxville case demonstrates the sometimes necessary and beneficial strategy of covert greening, it also illustrates its limitations and the importance of inclusiveness.

Conclusion: Future Work

So, what are the next steps for green economy (re)development as a political project? Well, the cases illustrate that green economies are not monolithic and instead are a unique blend of different shades of green. All four cities had a strong technopole, which most closely resembles the light green growth discussed in Chapter 2 and presented in Table A.1. However, there were variations. Knoxville's focus on advanced manufacturing is particularly instructive. Whereas most of Knoxville's green growth has occurred in its technopole and barred large swaths of its population from participation (see Muro, Rothwell, and Saha 2011), investments in high-tech innovation are beginning to attract advanced manufacturers to the region. In response, the Knoxville-Knox County

Chamber of Commerce, in partnership with local magnet academies and community colleges, are ramping up training in order to provide workers with the skills needed for the emergent jobs. The growing industry not only provides area leaders with the opportunity to engage a greater segment of its population in its technopole by offering green-collar jobs but also the opportunity to promote high road development. This example illustrates the importance of political will in seizing opportunities to deepen the City's shades of green.

And, much political will is needed to green U.S. cities in time to avoid the worst effects of impending socio-environmental crises. However, not just any shade will do. A light green transition, with its focus on incremental change and high-tech innovation, would fail to meet the challenges poised by climate change, neoliberal globalization, and deindustrialization. There are limits to growth, a position in which most light green advocates ignore. It is important, however, not to take follow the argument too far. The above discussion of Knoxville's advance manufacturing industry shows how high-tech innovation can promote deeper green development. Likewise, a radical and deep green transition is unlikely to provide the solution. Deep green localism has a tendency to over-romanticize the past and is often linked with regressive politics. Additionally, global demographic pressures and exacerbating environmental degradation seriously bring into question the Earth's carrying capacity and possibilities for a just transition without technological innovation. Instead, as evident by the case studies, a green transition is likely to entail a hybrid of high-tech and localist activity. Whether in the green technopole or localism, however, high or low road development is possible, reminding us that a just transition is a political process.

Concerning future research, I have identified three possibilities that would be especially fruitful for pushing forward a green transition. The first would entail more in-depth research into the Little Rock case. Interviews and field research would be especially insightful not only because Little Rock's green efforts are insufficiently publicized, but also because my research suggests the possibility of a 10th transition pathway, that is, one driven by large nonprofit organizations. Although such growth is clearly happening largely outside public knowledge, more in-depth and comprehensive research is needed to conclude if the nonprofit organizations themselves are driving such growth or if it the result of public-private partnerships. Future research may also include further refinement of the landscape. The categories and indicators offered in this study demonstrate how with careful conceptualization, the landscape can become a more robust and operationalized category. Additionally, the indicators lend themselves to quantification, which may also be a new and exciting direction for transition research. Lastly, adding "brown" or unsuccessful cases may provide insight into factors that lead to stasis in green economy transitions. In the cases examined here, particular sectors like waste management in Chicago and transportation in Austin certainly suggest at factors that contribute to stasis, and thus provide a good starting point for further analysis.

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Appendices

Table A.1 Shades of Green Economies

	Deep Green Economy	*Strong Green Economy*	*Light Green Economy*
Relation to Sustainable Development	Is synonymous	Is a tool for achieving	Is a necessary precursor
Political Philosophy	Socialism, anarchism	Social democracy	Neoliberalism
Economic Position	Ecological economics, steady state economics	Green capitalism; green Keynesianism	Neoliberal economics
Role of State	Emphasis on local governance and civil society	Developmental state; emphasis on regulation and policy	Minimal state role; emphasis on free markets
Growth	De-growth or no growth; decentralized localism; emphasis on redistribution	Limits to growth; coordinated, decentralized growth	Unbridled growth; emphasis on innovation
Indicators of Progress	Measures of wellbeing	Green GDP	GDP
Social Change	Revolutionary	Reformist	Incremental
Stance on Justice	Structural justice	Egalitarian justice	Market justice
Eco-philosophy	Ecocentric; anthropocentric	Anthropocentric	Technocentric
Theoretical Influences	Ecological Marxism; Treadmill of Production; Deep Ecology; Eco-socialism	Ecological Modernization; Transition Theory	Rational Choice Theory; Game Theory

Note: Adopted from Ehresman and Okereke's (2015) conceptualization of green economies and justice

Table A.2 Select Industries and Associated Occupations in the Green Economy

Industry	*Description*	*Select Occupations*
Agriculture and Natural Resources	Sustainable system of plant and animal production, as well as land-use policy	Organic farmer, FSC-certified forester, slow food activist, permaculture instructor, food bank manager
Construction	Sustainable design and construction of the built environment	LEED-certified contractor; weatherization technician, energy auditor, fiber composite researcher
Consultant	Design and advising for sustainable policies and infrastructure	Environmental engineer, energy system manager, communications consultant
Education	Pre- and post-secondary education, including workforce development	STEM teacher, apprentice, workforce development director, AmeriCorps volunteer, Intern
Energy and Resource Efficiency	Development of resource saving practices and technologies	Solar panel installer, gasification entrepreneur, lithium battery researcher
Manufacturing	Production of widgets with an environmental benefit or using a less polluting production method	Fair Trade coffee producer; 3-D or advanced manufacturer; solar panel producer; textile cooperative worker
Recycling, Waste Management, and Remediation	Collection, treatment, and disposal/reuse of waste materials/polluted landscapes	Recycling technician, waste treatment operator, bio-mimicry engineer, life cycle assessor, composter
Trade, Transport, Utilities	Sustainable provision of transportation and energy services	Electric vehicle mechanic, biodiesel process technician, Zipcar manager

Note: Adopted from the BLS (n.d.b) and Muro, Rothweall, and Saha (2011)

Table A.3 Typology of Socio-Technical Transition Pathways

Transition Pathway	Main actors	Interactions
Transformation	Regime and outside groups	Outsiders voice criticism; incumbent actors adjust regime rules
De-alignment-Realignment	New niche actors	Deep structural changes pressure regime; new entrants compete
Technological Substitution	Incumbent and new firms	Newcomers develop novelties that compete with regime technologies
Reconfiguration	Regime and niche actors	Regime adopts component-innovations by niche
Reproductive	Regime	No pressure causes reproduction of regime structure

Note: Adopted in-part from Geels and Schot (2007)

Table A.4 Archival Documents Collected by Stakeholder Group and Case

	Austin	Chicago	Knoxville	Little Rock
Agriculture	183	312	111	103
Construction	220	277	294	155
Governance	197	240	182	127
Research Commercialization	374	53	119	84
Transportation	269	247	144	159
Waste Management	54	57	58	53
Workforce Development	48	44	39	140
Total	1,342	1,230	947	821

N= 4,340

Table A.5 Descriptive Characteristics of Interviewees

Stakeholder Group	*Male*	*White*	*Age*	*N*
Agriculture	0.42 (1.00)	1.00 (1.00)	38.39 (35.00)	6 (1)
Construction	0.70 (1.00)	0.90 (1.00)	46.50 (45.00)	8 (1)
Education/Workforce Development	0.50 (0.33)	0.83 (0.75)	44.17 (43.33)	7 (3)
Governance	0.43 (0.50)	0.95 (0.50)	35.92 (42.50)	18 (2)
Research Commercialization	0.67 (-----)	0.67 (-----)	65.50 (-------)	6 (0)
Transportation	0.25 (0.00)	1.00 (1.00)	41.75 (45.00)	6 (1)
Waste Management	0.10 (-----)	1.00 (-----)	47.00 (-------)	5 (0)
Total	0.43 (0.50)	0.93 (0.85)	44.39 (42.17)	57 (8)

Note: Descriptive characteristics reported as estimates. Values depicted as proportions for male and white. Age depicted as years. Descriptive characteristics for Chicago participants in parentheses, all others pertain to Knoxville participants.

Table A.6 Descriptive Statistics for Smarter Cities Focus Groups

Variable	*Percentage*
Male	29.63
White	14.81
Age	
Under 30 Years	3.85
30-39 Years	11.54
40-49 Years	15.39
Over 50 Years	69.23
Education	
Some high school or less	11.11
High school/GED	14.81
Some college/associate degree	51.85
Bachelor or more	22.22
Occupation	
Service	13.64
Professional	18.18
Student	4.55
Homemaker	4.55
Retired	27.27
Unemployed	13.64
Other	18.18
Marital Status	
Single, never married	34.78
Married	21.74
Divorced	39.13
Widowed	4.35
Income	
Less than $25,000	43.48
$25,000- $34,999	17.39
$35,000- $49,999	8.70
$50,000-$99,999	8.70
Over $100,000	0.00
N= 27	

Note: Male refers to percent male. White and black were the only two racial categories.

Table A.7 Descriptive Statistics for Survey Respondents

Variable	*Percentage*
Male	60.00
Married	85.00
Age	
18-19 Years	0.00
20-29 Years	2.50
30-39 Years	20.83
40-49Years	33.33
50-59	17.50
Over 65 Years	25.83
Education	
Less than 12th Grade	0.00
High School Diploma/Equivalent	0.00
Some College	7.50
Vocational/Technical/Associates Degree	3.33
Bachelor Degree	28.33
Graduate/Professional Degree	60.83
Length of U.S. Residency	
Less than 11 Years	0.00
11-20 Years	0.83
25 Years or More	99.17
Race	
African America/Black	1.67
Asian/Pacific Islander	0.83
Caucasian/White	90.00
Hispanic/Latino	0.83
Native American	0.83
Other	5.83
Political Stance on Social Issues	
Liberal	50.00
Moderate	25.83
Conservative	18.34
Unsure	5.83
Political Stance on Fiscal Issues	
Liberal	25.83
Moderate	37.50
Conservative	30.83
Unsure	5.83
Religion	
Catholic	5.83
Jewish	0.83
Protestant	37.50
Other	30.83
None	25.00
Household Income	
Less than $25,000	5.88
$25,000- $44,999	10.92
$45,000- $64,999	6.72
$65,000- $84,999	12.60
$85,000- $104,999	19.32
$105,000- $124,999	10.92
Over $125,000	33.61
N= 146	

Table A.8 Comparison of Austin, Chicago, Knoxville, and Little Rock's Landscape

	Austin	*Chicago*	*Knoxville*	*Little Rock*
Demographics[1]				
Population	931,830	2,720,546	178,874	197,992
Population Growth (%)	14.8	.9	3.7	2.3
% White	48.7	31.7	74.2	46.7
% Black	8.1	32.9	17.1	42.3
% Hispanic	35.1	28.9	4.6	6.8
% Asian	6.3	5.5	1.6	2.7
% Foreign Born	18.4	20.9	5.6	6.8
% High School Graduate or Higher	87.0	81.6	87.0	90.4
% Bachelor's Degree or Higher	46.0	34.9	29.9	38.5
Macroeconomics[2]				
Median Household Income	$55,216	$47,831	$33,494	$46,409
Unemployment Rate (%)	3.4	5.8	5.4	4.7
Persons in Poverty (%)	19.0	22.7	24.6	18.0
Cost of Living Index (100 Average)	107	103	81	88
Average Housing Cost	$227,800	$225,700	$116,500	$151,600
Gross Domestic Product (Billion)	$107.4	$563.2	$38.3	$40.9
Culture[3]				
% Employed in Creative Sector	35.7	27.4	29.1	26.1
Community Well-Being Index (High Best)	68.8	66.8	64.6	64.5
% Republican	36.2	24.6	63.6	43.3
Environment[4]				
Rainfall (Inches)	33.4	35.9	47.4	51.5
Sunny Days	228	189	204	217
Comfort Index (High Best)	22	47	38	31
Air Quality (100 Best)	68.9	17.6	89	84.7
Water Quality (100 Best)	79	31	61	89
Köppen Climate Classification	(Cfa) Humid Subtropical	(Dfa) Humid Continental	(Cfa) Humid Subtropical	(Cfa) Humid Subtropical

[1] All are city estimates (U.S. Census Bureau [USBC] 2010f, 2010g, 2010c, 2010h).

[2] Unemployment rate and gross domestic product refers to metropolitan statistical area (see U.S. Bureau of Labor Statistics 2016; Parilla et al. 2015; Brown 2014). All other are city estimates (USBC 2010f, 2010g, 2010c, 2010h). Cost of Living index is based on a U.S. average of 100 (Sperling's Best Cities 2016).

[3] Creative sector refers to county estimates (U.S. Department of Agriculture 2014). Community well-being refers to metropolitan statistical area with higher values better as measured as Gallup-Healthways Global Well-being Index (Gallup 2016). Percent Republican refers registered voters citywide (Sperling's Best Places 2016).

[4] Rainfall, sunny days, air and water quality, and comfort index (i.e., based on humidity during hot months) are city estimates (Sperling's Best Places 2016).

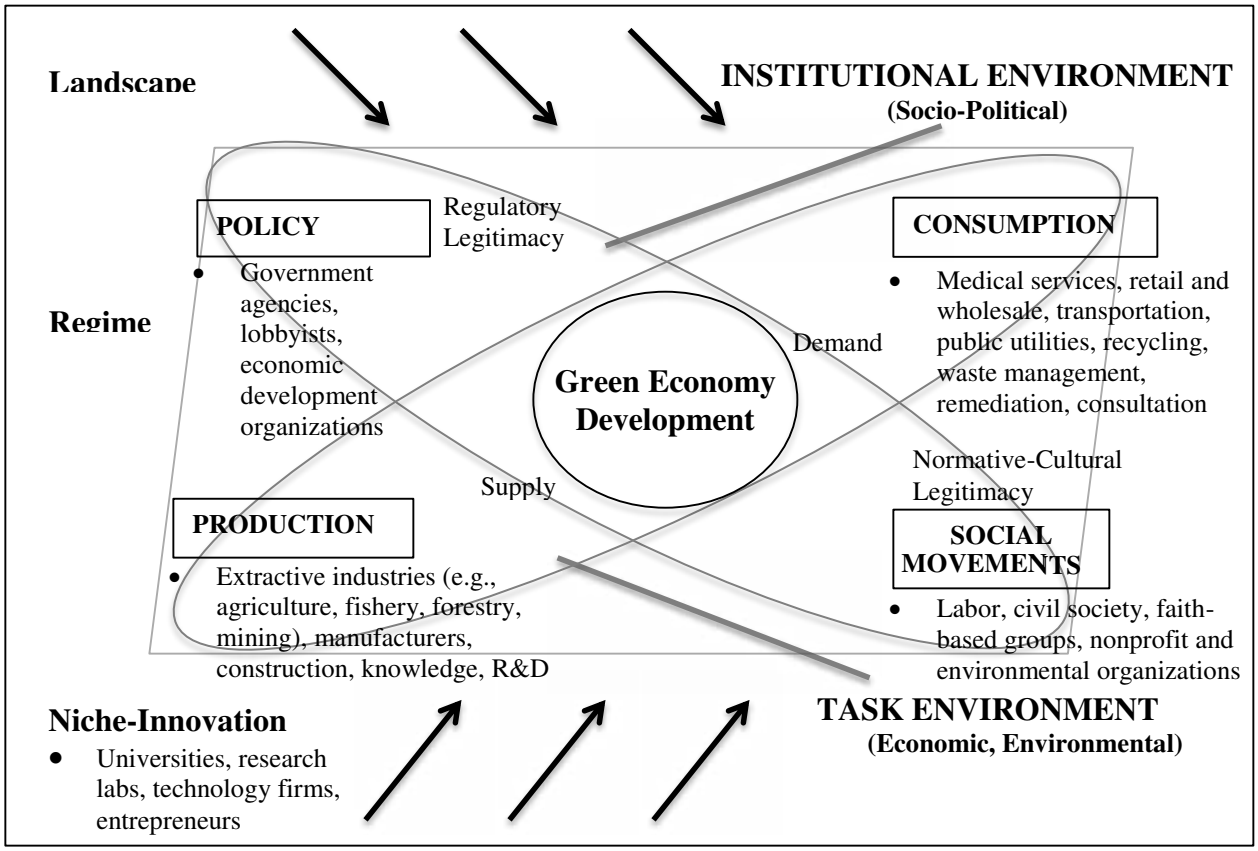

Figure A.1 An Embedded, Multilevel Representation of the Green Economy
Note: Adopted from Elzen and colleagues' (2011) representation of pig farming

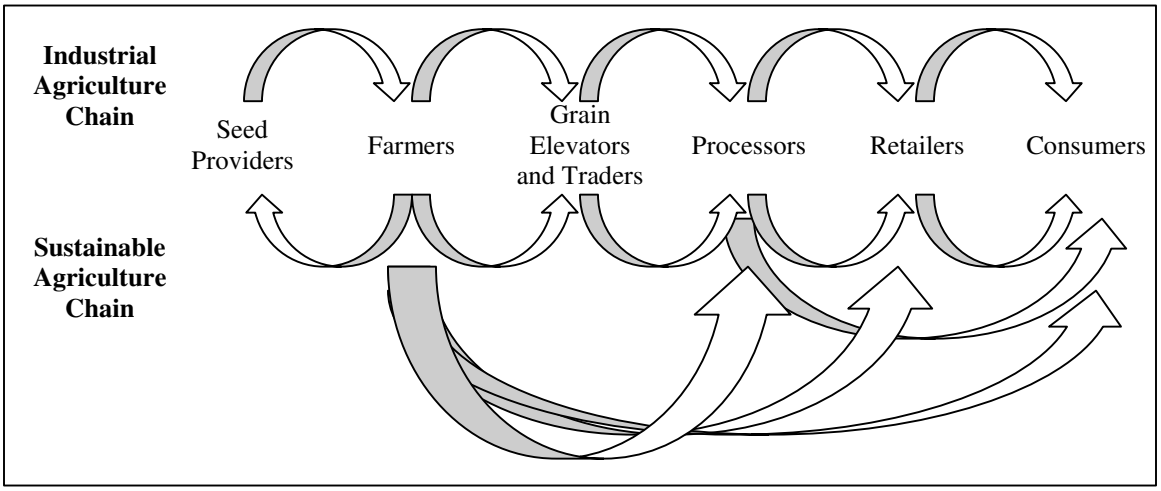

Figure A.2 Relationships between Agricultural Stakeholders
Note: Adopted in-part from Schurman and Muro's 2010 depiction of the global commodity chain typical for processed foods

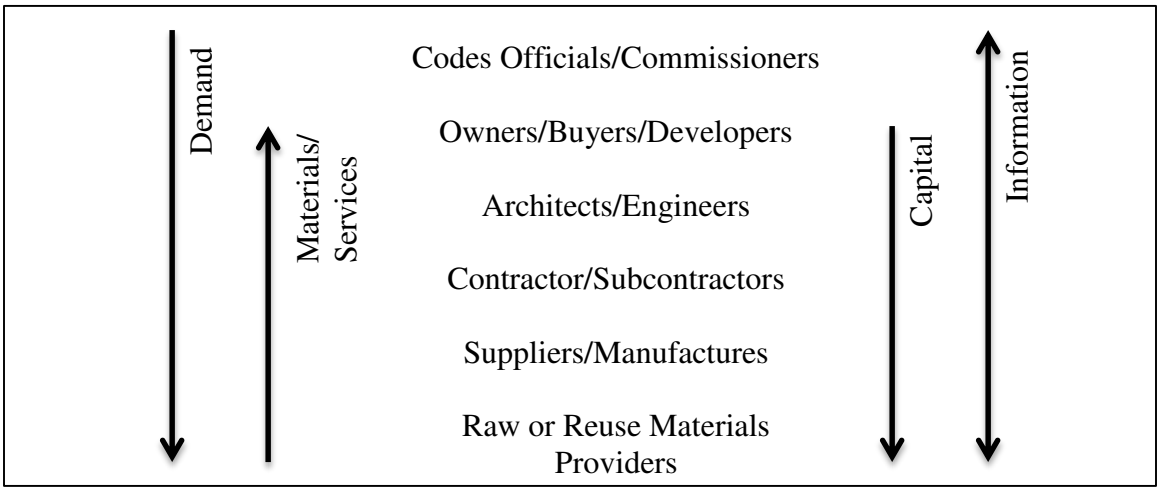

Figure A.3 Relationships between Construction Stakeholders

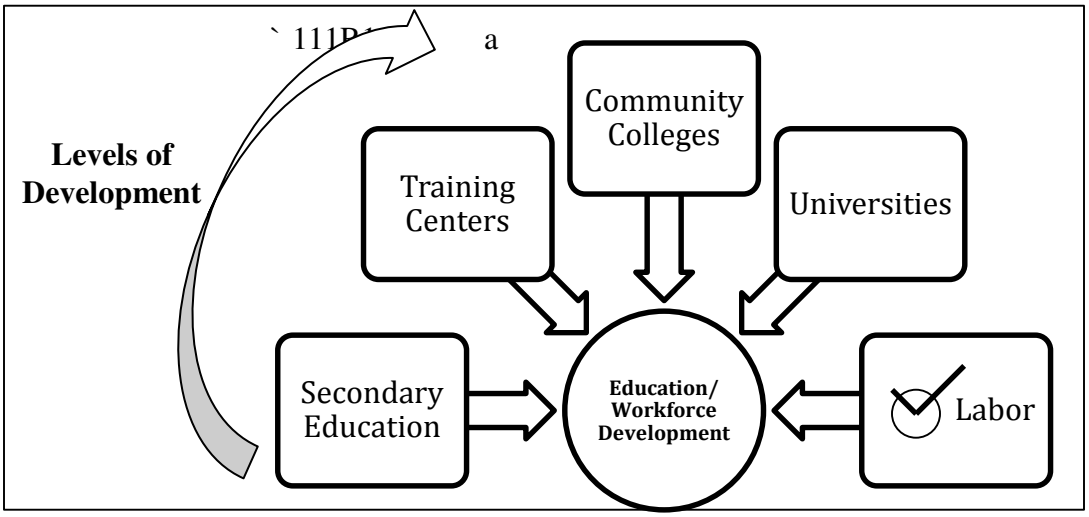

Figure A.4 Relationships between Education and Workforce Development Stakeholders

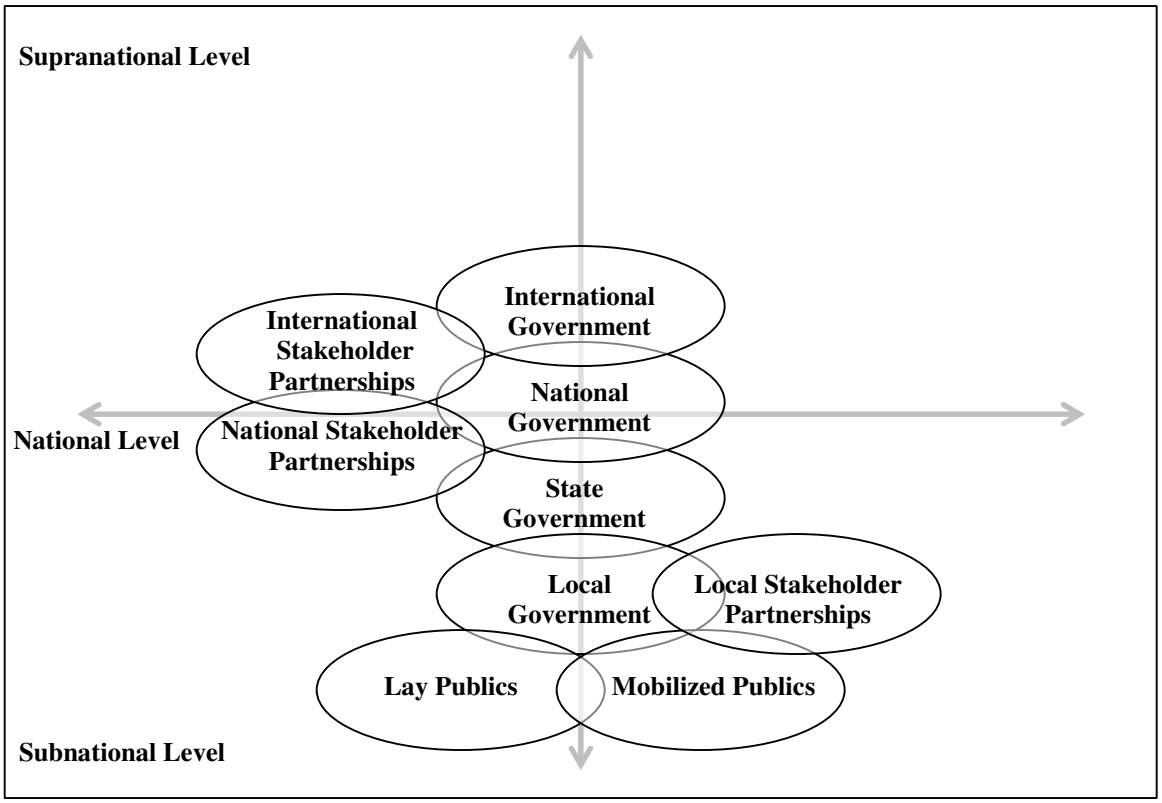

Figure A.5 The Multilevel Governance Framework

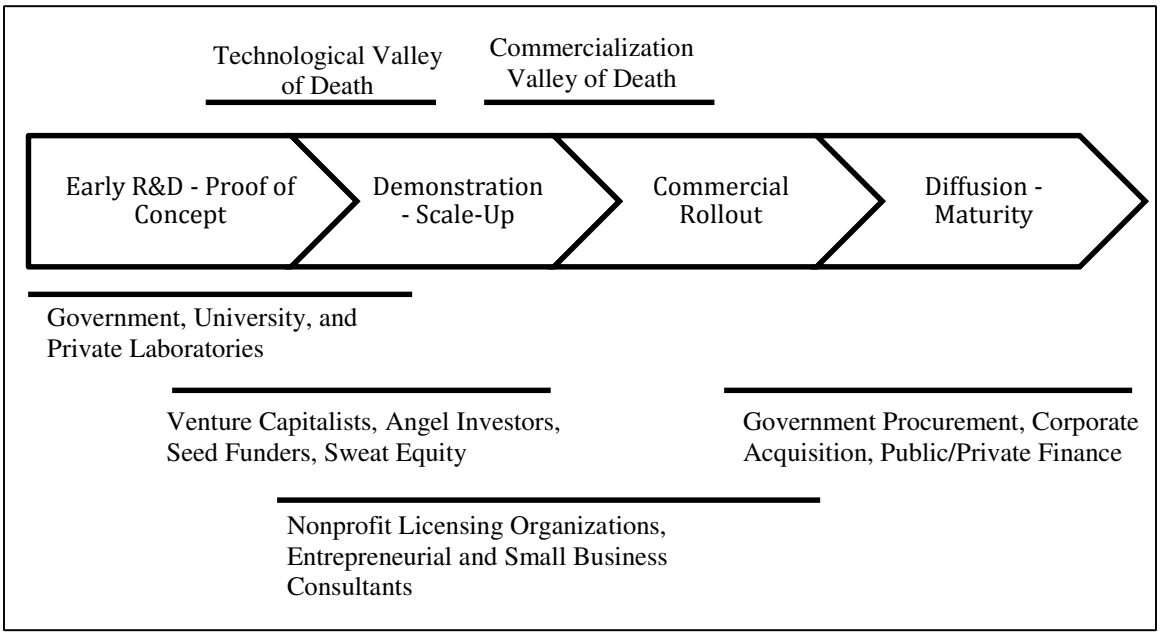

Figure A.6 Relationships between Research Commercialization Stakeholders
Note: Adapted in-part from Muro, Rothwell, and Saha (2011)

Figure A.7 Role of Stakeholders in Passenger Transportation

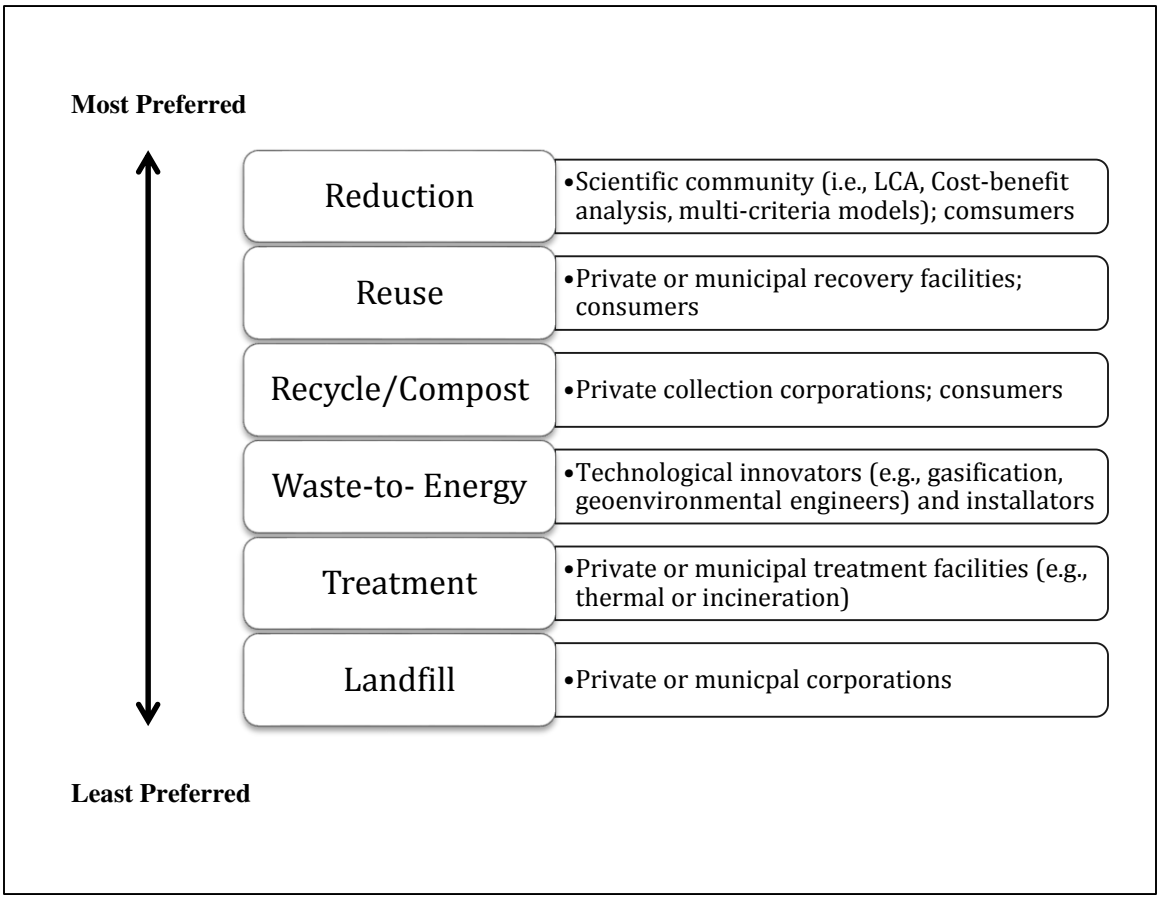

Figure A.8 Integrated Solid Waste Management System
Note: Adopted in-part from Frost and Sullivan (2009)

Appendix A. IRB Approval Letter

THE UNIVERSITY of TENNESSEE
KNOXVILLE
Office of Research & Engagement
INSTITUTIONAL REVIEW BOARD (IRB)

1534 White Ave
Knoxville, TN 37996-1529
865-974-7697
fax 865-974-7400

Date: June 19, 2014

To: Jon Shefner
Sociology
901 McClung Tower
Campus

Jenna Lamphere
Sociology
901 McClung Tower
Campus

From: Brenda Lawson
Office of Research
Compliances

Subject: Annual Review and Progress Report
Project Involving Research with Human Subjects IRB#: 8883 B

IRB-APPROVED RENEWAL

Project: Examining Knoxville's Green Potential

Initial Approval Date: June 1, 2012 Last Approval Date: June 19, 2014

Approval Expires: June 1, 2015

In response to our request regarding annual review and a progress report of the above protocol, you indicated that the study is still active and that there have been no changes with regard to the use of human subjects in this project since the last date of review. Therefore, the Institutional Review Board has approved the protocol until **June 2015**, which coincides with the anniversary month of your initial approval date.

If there should be any modifications in the project before the date of next annual review, please submit them, utilizing a Form D, to the Compliances Office immediately for review. Requests for your next annual review will be sent to you approximately one month prior to the expiration date.

Appendix B. Keyword Searches

Keyword	*Austin*	*Chicago*	*Knoxville*	*Little Rock*
3D	343 (2.62)	413 (0.24)	728 (1.79)	415 (2.41)
Advanced	2,095 (12.03)	5,600 (0.89)	1,615 (5.51)	7,816 (0.90)
Apprentice	117 (0.00)	617 (0.81)	74 (4.05)	775 (0.90)
Bike	2,086 (6.47)	4,649 (2.28)	823 (13.00)	2,251 (1.73)
Care Share	4 (0.25)	11 (27.27)	166 (1.81)	1,968 (0.25)
Commercialization	169 (15.98)	30 (5.00)	63 (26.98)	68 (5.88)
Compost	184 (11.41)	362 (8.84)	72 (15.38)	670 (1.79)
Energy	4,906 (4.22)	14,723 (1.73)	4,163 (6.73)	11,532 (1.15)
Entrepreneur	655 (7.33)	3,072 (1.27)	388 (8.51)	747 (2.14)
Farm	2,619 (3.70)	6,415 (1.47)	2,096 (2.86)	9,289 (0.45)
Garden	3,178 (1.23)	8,792 (1.88)	1,897 (1.21)	7,564 (0.36)
Green	5,888 (1.32)	21,455 (0.25)	5,129 (1.74)	26,525 (0.10)
Grid	482 (21.78)	1,038 (6.36)	213 (4.23)	626 (4.31)
LEED	24 (20.83)	129 (15.50)	54 (18.52)	73 (21.92)
Rainwater	245 (10.61)	223 (9.87)	75 (22.67)	223 (9.87)
Recycle	224 (20.09)	413 (8.47)	136 (27.21)	404 (9.65)
Remediation	63 (14.20)	180 (5.00)	75 (12.00)	359 (3.90)
Stormwater	45 (17.78)	732 (1.12)	103 (17.48)	120 (33.33)
Superfund	2 (0.00)	48 (2.08)	37 (32.43)	48 (0.00)
Sustainability	295 (19.32)	737 (11.00)	228 (10.53)	537 (1.86)
Tourism	410 (6.59)	2,579 (1.20)	616 (6.82)	2,097 (1.10)
Transit	919 (14.47)	3,249 (4.19)	275 (12.36)	1,544 (7.19)
Walkability	12 (0.00)	35 (5.71)	11 (0.00)	35 (11.43)
Weatherization	20 (25.00)	28 (25.00)	37 (10.81)	45 (15.56)
Total	24,985 (5.37)	75,530 (1.60)	19,074 (4.96)	75,711 (1.08)

Note: Number in parentheses is percent of documents per keyword included in analysis (i.e., percentage of articles I determined pertained to the green economy). In all, keywords searches yielded 195,300 documents and 2.22 percent were included in the analysis.

Appendix C. Interview Protocol

Note: This guide is modified slightly for participants according to their position in the various green economy sectors. The questions may also be modified based on specific and relevant programs, initiatives, or other activities performed by the participants or their respective organizations.

INTRODUCTION

Thank you so much for agreeing to speak with me. Before we get started, I would like to give you a little background information. I am a sociology Ph.D. student at The University of Tennessee, and I am conducting research on green economic development for my dissertation. My dissertation seeks to identify the various types of U.S. green economies, their shades of green if you will, and potential development pathways. More specifically, the objectives of this study are twofold: first, to obtain a greater understanding of the strengths and weakness of the area's green economy, and second, to identify potential growth opportunities.

If for any reason there are questions you do not feel comfortable answering, that is perfectly fine. Your participation in this study is completely voluntary, and you are free to stop the interview at any time. Is it okay if I audio record this interview? Also, I would like for you to take a moment, read over, and then sign this informed consent form; it provides a brief description of the project and contact information should you have any questions at any time about the study. Do you have any questions before we get started?

ABOUT YOUR WORK

1. First can you tell me a little about your work?
    - Probes: What services do you provide? What goods are being produced? What things are being done? How long have you been doing this work?
2. Why do you choose do this type of work?
3. What is your greatest concern about the work you are doing?
4. Who are the most important people doing work in the local green economy today?
    - Probe: How do you define the green economy?
5. What are the five most important organizations in the local green economy?
    - Probe: Who are the most important leaders in those organizations?
6. What is not being done that could help the industry grow?
    - Probe: What resources are needed? What is being done? What resources have proved instrumental?

ABOUT GROWTH AND CHANGE

7. Next, I would like to talk about potential growth, as well as some of the changes you have seen or might expect to see, in the next few years. Please feel free to answer in a national, as well as local, context. First, what are the biggest challenges facing leaders in your area of work today?
    - Probe: What are the biggest obstacles to growth? What are the biggest supporting factors?
8. What changes have you seen in the green economy in last few years?

- Probe: What changes do you expect to see in the next few years?

9. What developments on the horizon could affect future opportunities?

ABOUT GREEN JOBS

10. Now, I would like to shift a little and talk about jobs in your line of work. I am mostly interested in existing and potential occupational opportunities. First, how and why do most people enter this profession?
11. What educational preparation or vocational training would you recommend for someone who wants to get into this type of work?
12. What is the advancement potential in this area of work?
    - Probes: What is a typical path? Are too many or too few people entering this field?

ABOUT THE GREATER AREA'S GREEN ECONOMY

13. I am also interested in how you see the area's green economy, so I have just a few more questions about the area. First, do you see yourself fitting into the area's green economy?
    - If yes, how? If no, why not?
14. Do you see the area as a community working for greater sustainability?
    - If yes, what kinds of things are people doing? If no, how could people become more motivated?
15. What is the local government doing to make the area more sustainable?
    - Probes: What should it be doing? Who in the local government would you contact regarding concerns?

WRAP-UP

16. Before we end, I have just a few more questions. First, do you have any questions for me?
17. Is there anything else I need to know?
    - Probe: Is there something I should have asked but did not?
18. Lastly, my final question is, who else would you recommend I speak with?

FIELD NOTES (taken directly after the interview)

- Interview data and time:
- Respondent code:
- Job title, approximate age, sex, corresponding industry, and respective city:
- Describe recruitment and scheduling process:
- Describe setting:
- Describe any interruptions:
- Describe interviewee's disposition (e.g., mannerisms, mood, tone, etc.):
- Describe level of comfort and rapport:
- Additional information:

Appendix D. Focus Group Protocol for 2013 Forum

Ask the following questions in the morning session. The first set consists of general questions about the participants' work in relation to the green economy. The second set of questions is about growth and change.

1. Tell us about your work.
   - How do you see what you do fitting into the green economy?
2. Where do you see your own work going in the next two years?
3. What are the five most important organizations in the local green economy?
4. What are the five most essential elements to having a successful business in your industry?
5. What is not being done that could make your work more successful?

1. What is the biggest challenge facing the green economy today?
2. What changes do you expect to see in the next five years?
3. What areas do you want to see growth in?
   - In what areas should your industry grow?
   - How could the growth of other industries help you?
4. What are three things that could be done right now to help your industry grow?
   - What resources would be needed to make this happen?
5. What are the obstacles to growth in your industry?

Ask the following questions in the afternoon session.

1. How could Knoxville be greener?
   - What further connections need to be made?
   - What does Knoxville need from other green players (e.g., government, ORNL, the City of Knoxville, etc.)?
2. What does UT need to do?
3. What do you know now, that you didn't before?
   - How does that affect your thinking on the local green economy?
4. Is there anything else we need to know?
   - What are the important questions that we have not asked?
5. Who else would you recommend I speak with?

Appendix E. Focus Group Protocol for Smarter Cities Program

1. When you think about energy use or efficiency, what first comes to mind?
2. How important is household energy use or efficiency to you?
   - If important, why? Costs, environment, national security, home value?
3. What do you do to help evaluate your household energy use or efficiency?
   - Do you monitor household behavior or KUB bill?
4. What are the obstacles to making your household more energy efficient?
5. If you have questions or concerns over your household energy use or efficiency, where or who do you go to?
6. What would you like to learn more about when it comes to energy use or efficiency? Why?
7. Who would you trust to give you reliable and accurate energy use or efficiency information?
8. Are you aware of any programs, initiatives, or other resources that are currently available to help increase your household energy use or efficiency?
   - If yes, what are they? Where did you hear about them?
9. What sort of programs, initiatives, or other resources would you like to see available to help with your household energy use or efficiency?
10. What role do you think the City of Knoxville could play in improving our household energy use or efficiency?

Appendix F. Questionnaire for Smarter Cities Focus Group Participants

1. Do you rent or own your home?
   ☐ Own (Go to question 3) ☐ Rent

2. Do you pay your own electric or natural gas bill, or is it included in your rent?
   ☐ Included in rent ☐ Pay my own

3. In your household, who is responsible for decisions about paying your electric or natural gas bill?
   ☐ I am the primary decision maker
   ☐ Someone else and myself decide jointly
   ☐ Someone else in your household is the primary decision maker

4. Which company currently provides your electric power?
   ☐ Knoxville Utilities Board ☐ Don't know ☐Other _____

5. When it comes to your home, which best describes your preference for improvements and repairs?
   ☐ I prefer doing the work myself ☐ I prefer someone else do the work
   ☐ It depends on the project

6. What is your gender?
   ☐ Male ☐ Female

7. What is your age?
   ☐ 18-20 ☐ 30-33 ☐ 45-49
   ☐ 21-24 ☐ 34-39 ☐ 50+
   ☐ 25-29 ☐ 40-44

8. Which best describes your race or ethnicity?
   ☐ White or Caucasian ☐ Hispanic or Latino
   ☐ Black or African-American ☐ Native American or American Indian
   ☐ Asian or Pacific Islander ☐ Other _____

9. Which language or languages do you speak fluently?
   ☐ English ☐ Spanish ☐ Other _____

10. How long have you lived in the United States?
    ☐ Less than 2 years ☐ 5-9 years ☐ 15-19 years
    ☐ 2-4 years ☐ 10-14 years ☐ 20 years or more

11. What is the highest level of education you have completed?
    ☐ Some high school or less ☐ High school graduate or GED
    ☐ Some college or associate degree ☐ Bachelor's degree
    ☐ Graduate/professional degree

12. Which of the following best describes your occupation?

☐ Factory, manual labor ☐ Service ☐ Professional
☐ Student ☐ Homemaker ☐ Retired
☐ Unemployed

13. What is your current marital status?

☐ Single, never married ☐ Married ☐ Partnered
☐ Divorced ☐ Widowed ☐ Separated

14. Which of these categories best describes your annual household income?

☐ Less than $25,000 ☐ $35,000-$49,999 ☐ $75,000-$99,999
☐ $25,000-$34,999 ☐ $50,000-$74,999 ☐ $100,000 or more

15. Do you have any children under the age of 18 in your household?

☐ Yes ☐ No

16. What is the easiest way to reduce your utility bill the most- in other words, what will have the biggest impact? Rank #1 as easiest, #2 as second easiest, and on.

☐ Replace incandescent light bulbs with CFLs or LEDs
☐ Raise thermostat settings in the summer and lower them in the winter
☐ Wash clothes in cold water
☐ Cut baths and take shorter showers
☐ Unplug chargers, appliances, and electronics when not in use
☐ Install extra insulation
☐ Purchase an ENERGY STAR® qualified appliance
☐ Install a programmable thermostat
☐ Add caulking or weather-stripping
☐ Don’t know

17. Which of these things is the hardest for you to do? Rank #1 as the hardest, #2 as the second hardest, and on.

☐ Replace incandescent light bulbs with CFLs or LEDs
☐ Raise thermostat settings in the summer and lower them in the winter
☐ Wash clothes in cold water
☐ Cut baths and take shorter showers
☐ Unplug chargers, appliances, and electronics when not in use
☐ Install extra insulation
☐ Purchase an ENERGY STAR® qualified appliance
☐ Install a programmable thermostat
☐ Add caulking or weather-stripping
☐ Don’t know

Appendix G. Questionnaire for Knoxville Green Economy Leaders

UTGI Survey of the Knoxville Area's Green Economy Leaders

This set of questions is about your experiences and opinions about sustainability in the Knoxville area. By Knoxville area, we mean the greater metropolitan area.

1. Do you see Knoxville as a community working towards greater sustainability?
   ☐ Yes ☐ No ☐ Not Sure

2. When it comes to sustainability in Knoxville, which of the following, if any, do you see as strengths? (Check all that apply)
   ☐ Agriculture ☐ Climate/Geography ☐ Education, K-12
   ☐ Education, Post-Secondary ☐ Employment Opportunities ☐ Local Leadership
   ☐ Political Climate ☐ Public Transportation ☐ Recreation/Leisure
   ☐ Renewable Energy ☐ Waste Management ☐ Water Management
   ☐ Walkability/Bike-ability ☐ Other _____ ☐ None

3. Out of those you selected above, which would you identify as the Knoxville area's biggest strength? _____

4. When it comes to sustainability issues in Knoxville, which of the following, if any, would you say the area most needs to address (Check all that apply)
   ☐ Agriculture ☐ Climate/Geography ☐ Education, K-12
   ☐ Education, Post-Secondary ☐ Employment Opportunities ☐ Local Leadership
   ☐ Political Climate ☐ Public Transportation ☐ Recreation/Leisure
   ☐ Renewable Energy ☐ Waste Management ☐ Water Management
   ☐ Walkability/Bike-ability ☐ Other _____ ☐ None

5. Out of those you selected above, which would you identify as the most critical to address? _____

6. What do you think are the most important strategies to overcome the issue you identified as the most critical?

7. If you want to learn more about sustainability in Knoxville, where would you most likely go for information? (Select all that apply)
   ☐ The Knoxville News Sentinel
   ☐ The Greater Knoxville Business Journal
   ☐ Community Organization (please specify) _____
   ☐ Environmental Organization (please specify) _____
   ☐ Business (please specify) _____
   ☐ The University of Tennessee (please specify) _____
   ☐ Oak Ridge National Laboratory (please specify) _____
   ☐ Other (please specify) _____

This set of questions is about your knowledge of and experience working in the Knoxville area.

8. About how long have you worked in the Knoxville area?
   ☐ Less than 1 year ☐ 1-5 years ☐ 6-10 years
   ☐ 11-20 years ☐ Over 20 years

9. How would you best characterize the organization where you work? As a… (Circle one)
   ☐ Government ☐ Non-profit ☐ Private
   ☐ Quasi-government ☐ Other _____

10. What is the size of the organization where you work?
    ☐ Small (less than 50 employees) ☐ Medium (50-250 employees)
    ☐ Large (over 250 employees)

11. What position do you hold at work? _____

12. Why is your organization where you work located in Knoxville?

13. In what sector of the economy does your organization primarily work? (Circle one)

☐ Agriculture, forestry, fishing, hunting
☐ Mining, quarrying, oil/gas extraction
☐ Construction
☐ Manufacturing
☐ Transportation or utilities
☐ Retail
☐ Information
☐ Finance
☐ Professional/business services
☐ Education
☐ Health Services
☐ Leisure, hospitality
☐ Other _____

14. What are the significant barriers to your work? (Circle all that apply)

☐ Policies/regulations
☐ Investment capital
☐ Skilled/knowledgeable workers
☐ Availability of training programs
☐ Level of consumer knowledge
☐ Inter-sector information sharing
☐ Intra-sector information sharing
☐ Unstable markets
☐ Public opinion
☐ Other _____
☐ None
☐ Other _____

15. Out of those you suggested above, which is the biggest barrier? _____

16. What do you think are the most important strategies to overcome the barrier you identified as the biggest?

17. Do you consider your work as part of the green economy?

☐ Yes ☐ No ☐ Not Sure

18. How do you define "green economy?"

19. What percentage of workers in the Knoxville metropolitan area do you think are employed in the green economy?

☐ Less than 5%	☐ 6-10%	☐ 11-15%
☐ 16-20%	☐ 21-30%	☐ 31-40%
☐ 41-50%	☐ Over 50%	☐ Not Sure

20. Compared to other U.S. cities' green economies, do you think the Knoxville area's is:

☐ Growing faster	☐ Growing at a similar rate
☐ Growing slower	☐ Not sure

This set of questions is about your attitudes and beliefs about the environment.

21. Please indicate your strength of agreement with each of the following statements by circling your answer based on the following scale:

1- Strongly Disagree (SD) 3- Undecided (U) 5- Strongly Agree (SA)
2- Disagree (D) 4- Agree (A)

I am someone who…	SD	D	U	A	SA
a. Is aware of and cares about my impact on the environment	1	2	3	4	5
b. Is strongly connected to nature and the environment	1	2	3	4	5
c. Is a protector/nurturer of wildlife and their habitats	1	2	3	4	5
d. Others view as being an environmentalist	1	2	3	4	5
e. Views myself as an environmentalist	1	2	3	4	5
f. Is trying to be a better environmentalist	1	2	3	4	5 5
I identify with people who…					
g. Make significant changes in their lifestyle for environmental reasons	1	2	3	4	5
h. Feel they have the right to consume as much as they want	1	2	3	4	5
i. Don't care about their environmental impacts	1	2	3	4	5
j. Doubt global warming is happening	1	2	3	4	5
k. Doubt global warming is mostly caused by humans	1	2	3	4	5
I identify with…					
l. Groups that promote business interests	1	2	3	4	5
m. Big business and corporations	1	2	3	4	5
n. Governments working to protect the environment	1	2	3	4	5
o. Nonprofit organizations that promote environmentalism	1	2	3	4	5

22. Please answer each of the following statements by circling your answer based on the following scale:

1- Not at all (NA) 3- Somewhat (S) 5- A Great deal (GD)
2- Very little (VL) 4- Quite a bit (QB)

	NA	VL	S	QB	GD
a. How close are you to people who want to protect and preserve the environment?	1	2	3	4	5
b. How much of a role does protecting and preserving the environment play in your life?	1	2	3	4	5
c. In the last year, how frequently did you do things in settings that are close to nature or the environment?	1	2	3	4	5
d. How large of a role do these activities or actions play in the ideal person you strive to be?	1	2	3	4	5
e. In thinking about the future, how frequently will you do things in settings that are close to nature or the environment?	1	2	3	4	5

This last set of questions asks basic information about you for statistical purposes only. We appreciate the time you spent on this survey, and again, thank you for your participation.

23. Are you?
☐ Female ☐ Male

24. Are you?
☐ Married ☐ Widowed ☐ Divorced
☐ Single (never married) ☐ Other _____

25. Which best characterizes your age?
☐ 18-29 years ☐ 30-44 years
☐ 45-64 years ☐ Over 64

26. What is the highest level of education you have completed?
☐ Less than 12th grade ☐ High school diploma/equivalent
☐ Some college credit ☐ Vocational/technical/associate degree
☐ Bachelor degree ☐ Graduate/professional degree

27. About how long have you lived in the United Sates?
☐ Less than 1 year ☐ 1-5 years ☐ 6-10 years
☐ 11-20 years ☐ 25 years or more

28. Which best describes you?

☐ African American ☐ Asian/Pacific Islander
☐ White ☐ Hispanic/Latino
☐ Native American ☐ Other_____

29. How would you describe your political stance on most social issues?

☐ Very liberal ☐ Liberal ☐ Moderate
☐ Conservative ☐ Very Conservative ☐ Not Sure

30. How would you describe your political stance on most fiscal issues?

☐ Very liberal ☐ Liberal ☐ Moderate
☐ Conservative ☐ Very Conservative ☐ Not Sure

31. What is your religious preference?

☐ Protestant ☐ Catholic
☐ Jewish ☐ Muslim
☐ Other _____ ☐ None

32. What is your best estimate of your total household income over the last 12 months?

☐ Less than $25,000 ☐ $25,000-34,999 ☐ $35,000-44,999
☐ $45,000-54,999 ☐ $55,000-64,999 ☐ $65,000-74,999
☐ $75,000-84,999 ☐ $85,000-$94,999 ☐ $95,000 -104,999
☐ $105,000-114,999 ☐ $115,000-124,999 ☐ Over $125,000

Thank you for your help on this important study. Your responses will help us understand the area's green economy and identify factors to help it grow. If you would like to provide use with any additional comments, please do so in the space below.

Appendix H. Survey Results

Q1. Do you see Knoxville as a community working towards greater sustainability?

Yes	76.71%
No	6.16%
Not Sure	17.12%

Q2. When it comes to sustainability in Knoxville, which of the following, if any, do you see as strengths?

Agriculture	37.32%
Climate/Geography	50.00%
Education, K-12	23.24%
Education, Post-Secondary	50.70%
Employment Opportunities	22.54%
Local Leadership	58.45%
Political Climate	22.54%
Public Transportation	16.20%
Recreation/Leisure	69.72%
Renewable Energy	35.92%
Other	8.45%

Q3. Out of those you selected above, which would you identify as the Knoxville area's biggest strength?

Agriculture	0.72%
Climate/Geography	13.04%
Education, K-12	0.00%
Education, Post-Secondary	10.14%
Employment Opportunities	0.72%
Local Leadership	15.94%
Political Climate	5.07%
Public Transportation	1.45%
Recreation/Leisure	22.46%
Renewable Energy	0.72%
Other	9.42%

Q4. When it comes to sustainability issues in Knoxville, which of the following, if any, would you say the area most needs to address?

Agriculture	28.03%
Climate/Geography	11.36%
Education, K-12	33.33%
Education, Post-Secondary	19.70%

Employment Opportunities	34.85%
Local Leadership	22.73%
Political Climate	37.12%
Public Transportation	43.18%
Recreation/Leisure	5.30%
Renewable Energy	36.36%
Other	23.48%

Q6. What do you think are the most important strategies to overcome the issues you identified as the most critical? (Open-Ended)

- Agriculture
  - Ag needs to be brought to the household and neighborhood level
  - Engage with Ag Extension to grow local Ag and diversify food chain
  - Promote local food industry
- Climate/Geography
  - Educate/Incentivize industry to reduce emissions
  - More planning for stormwater management
- Education, K-12
  - Change daily routines at home via student education in energy, health, etc.
  - Long-term thinking
  - Reprioritize curriculum to reflect severity of climate change
- Education, Post-Secondary
  - Integration of leadership into the business community
- Employment Opportunities
  - Value-added products/services that yield profit enabling higher wages
  - Implement green-collar education
  - Better alignment between workforce development and emergent jobs
  - Structured pathways and clear communication about career prospects
  - Minimum energy efficiency standards for landlords
  - On-bill and property-accessed clean energy financing
  - Greater industry incentives
  - Prioritize brownfield redevelopment zones
  - Expand certification opportunities at post-secondary level
- Local Leadership
  - Branding and perceptions
- Political Climate
  - Mandatory voting
  - Register more voters
  - Simplify the language to jobs
  - Political will
  - More town hall-type meetings in communities
  - Carefully craft marketing/messaging
  - More Rogeros
- Public Transportation

Greater investment to reduce car dependency
Transit-oriented development and safe walkable/bikeable areas
Design more trails, sidewalks, etc.
Increase affordable and better routes to encourage public transportation
Encourage car sharing

Recreation/Leisure

Leverage strengths in natural resources

Renewable Energy

Greater participation in TVA's green power
More incentives for use and production of renewables
Strengthen ORNL technology via pipelining UT talent
Greater support from TVA and utilities
Greater government support
Tackle pollution via renewables

Other

Look at the Clemsons planning program to address health
See Local Energy Alliance Program, Charlottesville, VA, leap-va.org
Connect tree waste stream with woodworkers, artists, and cabinetmakers
Commercial composting
Encourage venture capital environment
Continue efforts to coordinate those with complementary needs/strengths
Align zoning with transportation and development

Q7. If you want to learn more about sustainability in Knoxville, where would you most likely go for information?

The Knoxville News Sentinel	15.04%
The Greater Knoxville Business Journal	7.52%
Community Organization	16.54%
Environmental Organization	18.80%
Business	6.02%
The University of Tennessee	33.08%
Oak Ridge National Laboratory	5.26%
Other	39.85%

Q8. About how long have you worked in the Knoxville area?

Less than 1 Year	3.01%
1-5 Years	10.53%
6-10 Years	12.03%
11-20 Years	18.08%
Over 20 Years	55.64%

Q9. How would you best characterize the organization where you work? As a…

Government	22.56%
Private	37.59%
Nonprofit	17.29%
Quasi-Government	8.27%
Other	14.27%

Q10. What is the size of the organization where you work?

Small (Less than 50 Employments)	51.15%
Medium (50-250 Employees)	12.03%
Large (Over 250 Employees)	35.34%
Not Sure	1.50%

Q11. What position do you hold at work?

Assistant	6.73%
Consultant	0.96%
Director/Executive/President/Vice	10.58%
Manager	11.54%
Organizer	1.43%
Owner/CEO	25.00%
Professor/Educator	10.58%
Other	12.50%

Q12. Why is your organization where you work located in Knoxville? (Open-Ended, Post-Hoc Coding)

Central Location	5.88%
Institutions	34.45%
Eastman Chemical Company	0.84%
L&M Depot	1.68%
Local Government	6.72%
Oak Ridge National Laboratory	2.52%
Public School System	1.68%
Tennessee Valley Authority	0.84%
The University of Tennessee	12.61%
Natural Amenities	1.68%
Need for Services	12.61%
Personal History	36.97%
Other	8.40%

Q13. In what sector of the economy does your organization primarily do work?

Agriculture, Forestry, Fishing, Hunting	12.21%
Construction	8.40%

Transportation or Utilities	8.04%
Information	5.34%
Professional/Business Services	13.74%
Health Services	0.00%
Mining, Quarrying. Oil/Gas Extraction	1.53%
Manufacturing	2.29%
Retail	1.53%
Finance	0.00%
Education	19.85%
Recreation/Leisure	3.82%

Q14. What are the significant barriers to your work?

Availability of Training	14.06%
Intra-Sector Information Sharing	10.94%
Inter-Sector Information Sharing	13.28%
Investment Capital	21.88%
Level of Consumer Knowledge	41.41%
Public Opinion	35.16%
Policies/Regulations	50.00%
Skilled/Knowledgeable Workers	23.44%
Unstable Markets	20.31%
None	9.38%
Other	20.32%

Q15. Out of those you suggested above, which is the biggest barrier?

Availability of Training	2.06%
Intra-Sector Information Sharing	1.03%
Inter-Sector Information Sharing	1.03%
Investment Capital	18.56%
Level of Consumer Knowledge	18.56%
Public Opinion	11.34%
Policies/Regulations	14.43%
Skilled/Knowledgeable Workers	9.28%
Unstable Markets	8.23%
None	1.03%
Other	14.43%

Q16. What do you think are the most important strategies to overcome the barrier you identified as the biggest? (Open-Ended)

Availability of Training
Intra-Sector Information Sharing
Institutional co-sponsorship for finance models

- Braking down silos and collaboration
- Inter-Sector Information Sharing
  - Cross-sectoral coordination
  - Point of contact database/clearinghouse
  - In-person convening and collaborative opportunities
- Investment Capital
  - Make area more attractive to national/international capital
  - More lending for spec building
  - Identify and develop additional funding streams
  - Clarify return of investments from green projects
  - Education and political will of community leaders
  - Need to better connect entrepreneurs with potential investors
- Level of Consumer Knowledge
  - Additional education of public and related officials
  - Education: All food is not the same!
  - Work with media for better marketing/messaging
  - Educate that recycling comes with a cost and is not free
  - Integrate information into school curricula
- Public Opinion
  - Outreach and education
  - Continued education about climate change and scale of change needed
  - Engage older folks or those without children in K-12 education
  - Educate public about health (e.g., drug abuse, mental health, sex, etc.)
  - Demonstrate and publicize success
- Policies/Regulations
  - Meat slaughter regulations need to change
  - Update land use regulations to better reflect vision and development
  - Government regulations are crippling business
  - Government benefits take away the motivation to work
  - Sensible reform that bases regulation on scale and merit
  - Reduction in federal regulations
  - Incentives improved for residential solar
  - Political will of City Mayor and Council
  - Greater government fiscal responsibility instead of good-ole boy system
  - Cut the red tape and add a little common sense
  - Greater government support for unions
  - More engaged county agents, professors, legislators, and Ag advocates
- Skilled/Knowledgeable Workers
  - Build a DOE-TVA-UT training center
  - Immigration reform
  - Overcome public image that construction is an undesirable profession
  - Reform welfare system and motivate people to work
- Unstable Markets
  - Intra-sector communication about accessing capital
  - Engage industry to be early adopters and drive change

Other

Develop a pipeline between K-12, higher education, and industry
Allow coal countries the opportunity to diversify
Focus on renewable benefits for low-income folks
Parents need to teach children work ethic and stop spoiling them

Q17. Do you consider your work as part of the green economy?

Yes	78.69%
No	12.30%
Not Sure	9.02%

Q18. How do you define "green economy?" (Open-Ended, Post-Hoc Coding) Definition included:

Economy	30.39%
Economy, Social	3.33%
Environment	7.50%
Environment, Economy	33.33%
Environment, Economy, Social	13.33%
Environment, Social	4.17%
Social	1.67%
Other	10.83%

Q19. What percentage of workers in the Knoxville metropolitan area do you think are employed in the green economy?

Less 5%	36.89%
6-10%	24.59%
11-15%	8.20%
16-20%	6.56%
21-30%	3.28%
31-40%	1.64%
41-50%	0.82%
Over 50%	1.64%
Not Sure	16.39%

Q20. Compared to other U.S. cities' green economies, do you think the Knoxville area's is:

Growing Faster	39.34%
Growing at a Similar Rate	17.21%
Growing Slower	13.93%
Not Sure	29.51%

Q21. Please indicate your strength of Agreement with each of the following statements by circling your answer based on the following scale: (Responses depicted as percentages)

1- Strongly Disagree (SD) 3- Undecided (U) 5- Strongly Agree (SA)
2- Disagree (D) 4- Agree (A)

I am someone who…	SA	A	U	D	SD
a. Is aware of and cares about my impact on the environment	70.49	27.87	0.00	0.82	0.82
b. Is strongly connected to nature and the environment	56.56	33.61	6.56	1.64	1.64
c. Is a protector/nurturer of wildlife and their habitats	45.90	43.44	5.74	3.28	1.64
d. Others view as being an environmentalist	28.69	29.51	28.69	10.66	2.46
e. Views myself as an environmentalist	28.69	37.70	23.77	8.20	1.64
f. Is trying to be a better environmentalist	48.36	36.07	11.48	2.46	1.64
I identify with people who…					
g. Make significant changes in their lifestyle for environmental reasons	28.10	44.63	23.14	3.31	0.83
h. Feel they have the right to consume as much as they want	1.65	4.96	19.01	36.36	38.02
i. Don't care about their environmental impacts	0.83	2.48	5.79	38.84	52.07
j. Doubt global warming is happening	4.13	2.48	13.22	19.01	61.16
k. Doubt global warming is mostly caused by humans	3.31	4.13	17.36	19.83	55.37
I identify with…					
l. Groups that promote business interests	14.88	33.06	31.40	13.22	7.44
m. Big business and corporations	4.96	16.53	23.97	30.58	23.97
n. Governments working to protect the environment	36.36	42.15	15.70	3.31	2.48
o. Nonprofit organizations that promote environmentalism	39.67	44.63	9.92	4.96	0.83

Q22. Please indicate your strength of Agreement with each of the following statements by circling your answer based on the following scale: (Responses depicted as percentages)

1- Not at All (NA)
2- Very Little (VL)
3- Somewhat (S)
4- Quite a Bit (QB)
5- A Great Deal (GD)

	NA	VL	S	QB	GD
a. How close are you to people who want to protect and preserve the environment?	0.00	1.67	27.50	40.00	30.83
b. How much of a role does protecting and preserving the environment play in your life?	0.00	3.33	25.00	40.00	31.67
c. In the last year, how frequently did you do things in settings that are close to nature or the environment?	0.00	2.50	17.50	39.17	40.83
d. How large of a role do these activities or actions play in the ideal person you strive to be?	0.83	1.67	22.50	31.67	43.33
e. In thinking about the future, how frequently will you do things in settings that are close to nature or the environment?	0.00	3.33	19.17	37.50	40.00

Appendix I. First Email to Participate in Questionnaire

Dear [Recipient],

The University of Tennessee's Green Economy Initiative (UTGI) invites you to complete a short questionnaire about the Knoxville area's green economy. The objectives of this study are twofold: to obtain a greater understanding of the strengths and weaknesses of the area's green economy and to identify potential growth opportunities.

You were selected to participate because you are a leader in the Knoxville area's green economy. You are an expert in your area of work and have a unique perspective on the status and potential development opportunities surrounding the area's green economy. This questionnaire aims to tap into that knowledge. All responses will be held in strict confidence and will be reported only in the form of aggregate tabulations or anonymous comments. This questionnaire should take less than 10 minutes to complete.

Follow this link to the questionnaire:

Take the Survey!

Thank you for your time.

Sincerely,

Jon Shefner
Executive Director of UTGI
Professor and Department Head of Sociology

Jenna A. Lamphere
Graduate Research Assistant

If you have any questions at any time about the study or the procedures, you may contact the principle investigator, Dr. Jon Shefner, at 901 McClung Tower at the University of Tennessee, and (865) 974-6021. If you have any questions about your rights as a participant, contact the Office of Research Compliance Officer at (865) 974-3499.

Appendix J. Reminder Email to Participate in Questionnaire

Dear [Participant],

The University of Tennessee's Green Economy Initiative (UTGI) contacted you last week to complete a short questionnaire about the Knoxville area's green economy. We would really appreciate your time in completing this questionnaire! The objectives of this study are twofold: to obtain a greater understanding of the strengths and weaknesses of the area's green economy and to identify potential growth opportunities.

You were selected to participate because you are a leader in the Knoxville area's green economy. You are an expert in your area of work and have a unique perspective on the status and potential development opportunities surrounding the area's green economy. This questionnaire aims to tap into that knowledge. All responses will be held in strict confidence and will be reported only in the form of aggregate tabulations or anonymous comments. This questionnaire should take less than 10 minutes to complete.

Follow this link to the questionnaire:

Take the Survey!

Thank you for your time.

Sincerely,

Jon Shefner
Executive Director of UTGI
Professor and Department Head of Sociology

Jenna A. Lamphere
Graduate Research Assistant

If you have any questions at any time about the study or the procedures, you may contact the principle investigator, Dr. Jon Shefner, at 901 McClung Tower at the University of Tennessee, and (865) 974-6021. If you have any questions about your rights as a participant, contact the Office of Research Compliance Officer at (865) 974-3499.

Appendix K. Final List of Codes

Agriculture
Community Shared Agriculture
Compost
Electronic Benefit Transfer
Fertilizer
Food Access
Food Hub
Food Truck
Garden
Greenhouse
Permaculture

Construction
Code
Energy Audit
Energy Star
Heat Pump
LED Lights
LEED
Off-Grid
Permeable Pavement
Rainwater
Stormwater
Tiny House
Weatherization

Finance
Angel Investor
Expense
Fundraiser
Grant
Incentive
Lack of
Loan
Municipal Bonds
Property-Accessed Clean Energy
Reparation
Return On Investment
Revolving Loan
Tax Increment Financing
Venture Capital

Labor/Workforce
Apprenticeship
At-Risk Youth
Brain-Drain
Career Path
Certification
Collective Bargaining
Dual Enrollment/Credit
Employee Engagement
Entrepreneurship
Intern/Externship
Green Jobs
Recruitment
STEM
Talent
Wages
Worker Training

Landscape
Business Climate
Culture
Race
Religion

Legislation/Policy
2012 International Green Construction Code
2012 International Energy Conservation Code
2012 Residential Code
American Reinvestment and Recovery Act
Bag Ban
Bottle Bill
CAFE Standards
Clean Air Act
Drive to 55
House Bill 747
House Bill 948
Low-Income Home Energy Assistance Program
MS4 Standards
POWER Plus
Right-to-Work
Small Business Innovation Research
Tennessee Promise
Tennessee Reconnect
Workforce Innovation and Opportunity Act
Workforce Investment Act

Manufacturing
Advanced Manufacturing
Automation
Carbon Fiber
Quality Control

Motive
Economic Development
Empowerment
Environment
Food Security
God
Helping People
Jobs
Justice
Money
Quality of Life

Labor Benefits
Organized Labor
Status
Other Values

Organizational Strategy
Cluster
Coalition
Consortium
Cooperative
Network
Niche
Outsourcing
Partnership
Sponsorship

Outreach
Awareness
Branding/Marketing
Clearinghouse
Communication
Data Center
Education
Promotion

Politics
Campaign Contributions
Campaign Candidates
Political Will
Poor Policies
Think Tank
Voting
Taxes
Zoning

Research and Development
Exit
Licensing
Market Assessment
Patent
Spin-Off
Start-Up
Technology

Utilities
Community Solar
Distributive Generation
Energy
Micro-Grid
Power Plant
Smart Grid

Transportation
Alternative Fuel
Bicycling
Bike Lanes
Complete Streets
Greenways
Rail
Trails
Transit-Oriented Development
Walkability

Waste Management
Liter
Pollution
Recycle
Remediation
Waste Water

Other
Best Practices
Case Study
Discrimination
Green Economy
Infrastructure
Leadership
Liability
Long-term Thinking
Placemaking
Rural/Urban Differences
Tourism
Sustainability

Distribution/Logistics

Note: Responses to each interview question (i.e., see Appendix C) were also coded. So too were major actors (i.e., see Appendices L, M, N, and O).

Appendix L. Top 30 ARRA Fund Recipients in Knox County

Recipient	*Amount*	*Type*	*Description*	*Agency*	*Date*
The University of Tennessee	$46 million	Grant	State Fiscal Stabilization Fund to restore public elementary, secondary, and postsecondary education	ED	5/18/09
The University of Tennessee	$31 million	Grant	State Energy Program to enhance existing funding programs	DOE	4/20/09
The University of Tennessee	$29 million	Grant	State Energy Program to enhance existing funding programs		4/20/09
Knox County Schools	$22 million	Grant	State Fiscal Stabilization Fund to restore public elementary, secondary, and postsecondary education	ED	5/18/09
Multiple	$19 million	Direct P	Social Security Economic Recovery Act Payments	Social Security	6/30/09
Multiple	$17 million	Loan	Low to moderate income housing loans	USDA	2/28/10
Safety and Ecology Holdings Corp.	$15 million	Contract	Provide jobs and accelerate decontamination and demolition	DOE	7/24/09
Knox County Schools	$13 million	Grant	State Fiscal Stabilized Fund, Race-to-the-top funds for education reform	ED	7/28/10
Glaxosmithkline Holdings	$13 million	Contract	Purchase of pediatric vaccines	DHHS	6/17/10
E. TN Human Resource Agency	$10 million	Grant	Weatherization assistance for low-income persons	DOE	3/27/09
Knox County Schools	$10 million	Grant	Title 1 grant to improve teaching and learning for at-risk students	DOE	8/31/09
Deltacom	$9 million	Grant	Expand fiber network to provide high speed Internet services	USDC	2/28/10
Enernex	$9 million	Contract	Establish and administer a Smart Grid Interope	USDC	8/19/09
Claiborne Hauling	$9 million	Contract	D&D of building K-33 at the E TN Technology Park	DOE	4/06/10
The University of Tennessee	$8 million	Grant	Adapt, deploy, and support visualization and data analysis capabilities	NSF	7/24/09
The Universe of Tennessee	$8 million	Grant	State Fiscal Stabilization Fund for implementing education reform	DOE	7/28/10
Knoxville's Community Development Corporation	$8 million	Grant	Public Housing Capital Fund to modernize public housing buildings	HUD	3/18/09
Glaxosmithkline Holdings	$7 million	Contract	Purchase of adult vaccines	USDHHS	8/28/09

Recipient	*Amount*	*Type*	*Description*	*Agency*	*Date*
Knoxville's Community Development Corporation	$7 million	Grant	Public Housing Capital Fund for projects stalled due to funding	USDHHS	9/24/09
Knoxville's Community Development Corporation	$6 million	Grant	Weatherization assistance for low-income persons	DOE	3/27/09
City of Knoxville	$6 million	Grant	Enhancements to a transit projects	DOT	8/20/09
The University of Tennessee	$6 million	Direct P	Federal Pell Grant Program	ED	4/19/10
National Resource Management	$5 million	Contract	Remediation of radiological contaminated facilities at Brookhaven	DOE	4/16/09
Safety and Ecology Corporation	$5 million	Contract	Environment and infrastructure work to reduce risks from Cold War legacies	DOE	5/07/09
Tennessee Telephone Company	$5 million	Grant	Provide high-speed DSL broadband to rural areas	USDA	8/25/10
Great Smokey Mountain Enterprises	$5 million	Loan	Aid small businesses unable to obtain financing in the private credit marketplace	SBA	12/28/10
Hallsdale-Powell Utility District	$5 million	Grant	Capitalize a revolving loan fund to finance wastewater treatment facilities	EPA	7/14/09
Pellissippi State Community College	$5 million	Direct P	Federal Pell Grant Program	ED	5/13/09
Glaxosmithkline Holdings	$4 million	Contract	Purchase of pediatric vaccines	USDHHS	4/15/10
Pellissippi State Community College	$4 million	Grant	State Fiscal Stabilization Fund to restore public elementary, secondary, and postsecondary education	ED	5/18/09

Appendix M. Timeline for Knoxville's Green Economy Development

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
2007	Energy and Sustainability Initiative	Conduct an energy baseline inventory	A 15-member task force completed the study and made policy recommendations (completed 2010)	City of Knoxville, ORNL, TVA, UT, SACE, Alcoa, USGBC, others
	ICLEI Partnership	Build international clearinghouse on sustainable development	Joined global network of governments to share policies, programs, and techniques	City of Knoxville, ICLEI
2008	DOE Solar American City	Encourage and facilitate the use of solar for residents and businesses	Via a competitive grant, the City was awarded $400,000 to fund Solar Knoxville, a citywide program, and a sustainability coordinator position (completed 2011)	City of Knoxville, DOE, SACE, TVA, KUB, ORNL, TDEC, PSCC, Ijams Nature Center, others
	Green Development Grant Program	Support green infrastructure and low-impact development projects	Via $10,000 grant, developed downtown dog park with green infrastructure	City of Knoxville, TDEC
2009	Ameresco Contract	Improve energy efficiency in municipal buildings and reduce utility bills via retrofits	$19 million, 13-year performance contract signed for $1.1 million in annual savings	City of Knoxville, Ameresco
	South Waterfront Redevelopment	Redevelop former brownfield site and establish the City's first eco-district	Via federal and state grants, private donations, City funds, and TIF, $130 million in eco-friendly improvements are planned for next 30 years	City of Knoxville, Knox County, EPA, Knoxville Community Development Corporation, others
	Cherokee Farm Innovation Campus	Establish an international campus for science and technology innovation	The 200-acre campus's infrastructure was funded by a $32 million state grant, is home to JIAM, and soon to house IACMI (site completed 2012)	UT, ORNL
	Tennessee Solar Institute	Distribute ARRA funds for solar	$23.5 million administered (completed 2012)	ORNL, UT, DOE
	Healthy Kids, Healthy Communities	Fight childhood obesity	Via $360,000 Robert Wood Johnson Foundation grant, launched program to increase food access and more (completed 2013)	Beardsley Farms, Knox County Health Department, Robert Wood Johnson Foundation
	Trane Contract	Improve energy efficiency in County buildings and reduce utility bills via	$10.2 million infrastructure-improvement contract to save $16	Knox County, Trane

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
		retrofits	million over 15 years	
	Energy and Sustainability Work Plan	Develop strategy to make the City more sustainable	Provided energy baseline information and 33 strategies (updated 2012, 2014)	City of Knoxville, Energy and Sustainability Task Force
	Knoxville Station Transit Center	Build a green bus station hub to service the area	A $29 million certified LEED Silver station was constructed with ARRA funding (completed 2010)	City of Knoxville, State of TN
	Tennessee Municipal League Achievement Award	Recognize excellence in green leadership	The City was recognized for its Energy and Sustainability Initiative (also awarded in 2014)	City of Knoxville, Tennessee Municipal League
2010	City of Knoxville's Sustainability Program Manager	Established manager position, which replaced the sustainability coordinator position	$260,000 ARRA DOE grant, funded sustainability position for two years (locally funded in 2012)	City of Knoxville, DOE
	City of Knoxville's Household Curbside Recycling Program	Provide citywide single-stream recycling	With $700,000 in ARRA DOE funding, over 20,000 residents (max) enrolled	City of Knoxville, DOE, Waste Connections
	Plan East Tennessee	Develop a sustainable, regional plan	Via a $4.3 million HUD grant and $2.5 million in matching funds, a consortium was established to implement study (completed 2014)	UT, ORNL, City of Knoxville, Knox County, Metropolitan Planning Commission, others
	Knoxville Convention Center	Improve the center's sustainability	Via $250,000 ARRA DOE grant and $750,000 in financing, installed 120KW of solar panels, earning LEED silver certification (completed 2012)	City of Knoxville, DOE, SMG Management, Sustainable Future
	Pellissippi Place	Recruit R&D businesses to area	Via $20 million in local funds, developed 150-acre, LEED-certified business park	Knox County, Blount County, City of Maryville, City of Alcoa
	Carbon Fiber Technology Center	Build a research and demonstration site for carbon fiber industries	Via $30 million in ARRA funds, built 50,000 sq. foot site	ORNL, DOE, Partners Development of Knoxville, others
2011	Oak Ridge Carbon Fiber Consortium	Support the research and development of advanced carbon fiber	Attracted over 40 member companies across the carbon fiber supply chain	Dow Chemical Company, UT-Battelle, Innovation Valley, others

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
	Knoxville's Green Building Incentive Program	Incentivize efficiency improvements in residential and commercial, nonprofit business buildings	Via an ARRA DOE grant, $270,000 was provided for efficiency upgrades (completed 2012)	City of Knoxville, CAC, DOE, others
	Southeast Sustainability Director's Network	Build a network of local government sustainability officials	Over 30 members share best practices and collaborate on projects	City of Knoxville, City of Asheville, NC
	DOE Rooftop Solar Challenge	Improve efficiency and reduce cost of solar installation for homes and businesses	Via a competitive ARRA DOE grant, $622,000 was administered for model permitting, interconnection, more	TSI, DOE, City of Knoxville, ORNL, UT, others
	L&N STEM Academy	Provide "real world" education to 8-12th graders in science, technology, engineering, and mathematics	Via $2 million in federal Race to the Top funds and $200,000 in (annual) City funds, launched academy	City of Knoxville, ED
2012	DOE Better Buildings Challenge Partner	Reduce GHG emissions by 20 percent by 2020 via city government leadership	Emissions from City and community are down 13 and 8 percent, respectively	City of Knoxville, DOE
	City of Knoxville's Office of Sustainability	Established an internally-funded Office of Sustainability	Funded two full-time staff people via $146,120 from the FY 2012-13 budget	City of Knoxville
	EV Project	Deploy electric vehicles and charging infrastructure	Via $400,000 DOE grant, 24 charging stations were installed citywide	ORNL, DOE, City of Knoxville, others
	Pathway Lending Mayor's Challenge	Provide affordable capital to businesses for improvements	Administered $10 million for business energy-efficiency projects	City of Knoxville, Pathway Lending
	Urban Wilderness Corridor	Develop a recreational, cultural, and historic preservation corridor	Via private donations, grants, and City funds, corridor includes 1,000 forested acres, 40 miles of trails, and more	City of Knoxville, Knox County, Legacy Parks Foundation, others
	Bloomberg Mayor's Challenge	Encourage cities to develop innovative solutions to social challenges	Top 20 contender for urban agriculture corridor idea	City of Knoxville, Bloomberg Philanthropies
	Earth Hour City Challenge	Promote renewable energy and climate change preparedness	Commitment to reduce greenhouse gas emissions	City of Knoxville, World Wide Fund for Nature
	Green Development Grant Program	Support green infrastructure and low-impact development projects	Via $28,000 grant, retrofit stormwater infrastructure, more	City of Knoxville, TDEC, TVA, TDOT, others
	2012 International Green Building Code	Establish standards for sustainable building	Adopted for voluntary compliance	City of Knoxville, USGBC, others

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
	IBM Smarter Cities Partnership	Improve efficiency and affordability of inner city homes	Via $400,000 grant, expert consultation led to local coalition working on implementation	City of Knoxville, IBM, others
	Advanced Manufacturing Jobs and Innovation Accelerator Challenge	Strengthen local manufacturing via public-private partnerships that link business, colleges, and other stakeholders in an area cluster	Over $2 million federal grant was awarded to launch the Advanced Manufacturing and Prototyping Center (AMP!) (completed 2016)	ORNL, PSCC, UT, TN Manufacturing Extension Partnership
2013	Let's Grow Knoxville's GE Forum	To join local GE to discuss growing the local GE	Over 80 representatives met (held again in 2015)	UTGI, City of Knoxville, others
	Green Development Grant Program	Support green infrastructure and low-impact development projects	Via $29,190 grant, launched student-led rain garden projects on east campus	UT, TDEC
	Zipcar Partnership	Increase access to affordable, convenient transportation	Via $115,000 regional grant, fees were waived for first-year membership to share four cars	City of Knoxville, Knoxville Regional TPO, Zipcar
	Energy Leadership Award	Award public service	Mayor Rogero was honored by the Energy Efficiency Forum	City of Knoxville, Energy Efficiency Forum
	TVA Green Power Switch Award	Award outstanding community participation in TVA's Green Power Switch program	The City was awarded for its purchase of 375 blocks each month, the equivalency of 56,250 kilowatts of renewable energy	City of Knoxville, TVA
	TVA Platinum Valley Sustainable Community Award	Recognizes communities that commit to sustainability while integrating economic development efforts	The City was evaluated and honored for its efforts in health and wellness, resiliency, education, and more	City of Knoxville, TVA
	State, Local, and Tribal Leaders Task Force on Climate Preparedness and Resilience	Advise federal government on how best to address the needs of communities impacted by climate change	Mayor Rogero was elected to participate on task force	City of Knoxville, Federal Administration
2014	Partners for Places	Implement findings from Smarter Cities Challenge	$60,000 in local and regional grants provided energy efficiency education to low-income residents	City of Knoxville, E. TN. Foundation, United Way of Greater Knoxville, others
	Climate Knoxville on the Square	Promote and support City sustainability initiatives	Nearly 500 residents participated in music, comedy, talks, and more	City of Knoxville, Climate Knoxville, others

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
	Georgetown University Energy Prize	Spur innovation, highlight best practices, and educate the public on energy efficiency	Quarterfinalist in $5 million competition for its long-term efficiency plan	City of Knoxville, UT, KUB, Knox County Schools
	Career Magnet Academy	Prepare 8th-12th graders for high-skilled, high demand, and high wage careers while also teaching standard coursework	The first cohort consisted of 127 students, each of which enrolled in one of four pathways: advanced manufacturing, homeland security, sustainability, teaching	Knox County Schools, Pellissippi State Community College
	DOE Climate Action Champions Award	Identify local and tribal climate leaders	16 communities were selected for their action to build resiliency while cutting carbon	DOE, City of Knoxville
	Tennessee Municipal League Achievement Award	Recognize excellence in green leadership	The City was recognized for its ongoing efforts to its Energy and Sustainability Initiative (also awarded in 2009)	City of Knoxville, Tennessee Municipal League
2015	Round It Up	Improve efficiency and affordability of low-income homes	Utility bills are rounded and funds, estimated at $500,000 annually, provide low-income weatherization	City of Knoxville, KUB, CAC
	Smart Growth America	Assist cities in transit-oriented development	Via competitive grant, experts assisted in developing mass transit plan	City of Knoxville, KAT, Smart Growth America
	Knoxville Extreme Energy Makeover	Improve efficiency and affordability of low-income homes	$15 million TVA grant to weatherize approximately 1,100 low-income homes	City of Knoxville, TVA, CAC, KUB, others
	IACMI	Accelerate manufacturing technologies for low-cost, energy-efficient composites	$259 million consortium of 122 public-private members to be built on Cherokee Innovation Valley	DOE, UT, ORNL, others
	Ameresco Contract	Increase efficiency of Knox County Schools' facilities	$12.5 million contract to install five megawatts of solar on 11 schools, estimated to save $29 over 30 years	Knox County, Ameresco
	Bell Built Grant	Technically assist applicant for development of gravity trail	AMBC awarded $100,000 for projected trail in Urban Wilderness	AMBC, Bell Helmets, IMBA

Appendix N. Timeline for Austin's Green Economy Development

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
1979	Austin Tomorrow Plan	Develop a comprehensive plan for citywide growth	Engaged over 3,500 residents to develop a multi-sector plan	City of Austin
1977	IC^2 Institute	Test the belief that innovation via triple helix can drive economic development	Has helped over 250 companies and raised $1 billion in investments	UT, Triton Venture, Teeple Partners, others
1982	City of Austin's Bond Initiative	Fund the land acquisition and preservation	Allocated $5.7 million	City of Austin
1985	Austin Energy Star	Delay construction of new power plant by conserving energy use	Implemented an energy rating system, in which 6,000 homes participated (concluded in 1991 with establishment of Green Building program)	City of Austin
1989	Hornsby Bend Biosolids Management Plant	Update the City's waste processing plant	Via federal funding, installed digestion tanks that compost waste, which is sold under the name Dillo Dirt	City of Austin
1990	Austin Energy Green Building	Establish sustainable building program	Developed rating system for energy-saving building codes via $50,000 EPA grant (updated 2010)	City of Austin, International Code Council, Center for Maximum Potential Building Systems, others
1992	Save Our Springs Ordinance	Protect Austin's creeks, rivers, lakes, and springs	Addressed development in Barton Springs Zone	Zilker Park Posse, Barton Creek Association, Sierra Club, Save Our Springs Alliance, others
1993	Sustainable Food Center	Create a food-secure community, increase equity, and teach sustainable gardening	Hosts public workshops, forums, and a farmers' market	Austin Community Gardens
1995	2025 Austin Metropolitan Area Transportation Plan	Improve quality of life for Austinites via transportation planning	Establishes and tracks performance measures and identifies ways to improve (updated 2016 via "Austin Strategic Mobility Plan)	City of Austin
1997	GirlStart	Empower young women in areas of STEM	Is the nation's only community-based, informal STEM-based nonprofit organization, which offers after school, summer camp, and more	Austin360

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
1998	Smart Growth Initiative	Develop plan to combat sprawl via deliberate green growth	Established the Drinking Water Protection and Desired Development Zone	City of Austin
2000	Keep Austin Weird	Retain the City's unique personality	Moto reflects resistance to changes in the urban cultural landscape	Austin Community College
	City of Austin's Urban Farm Ordinance	Regulate urban farm use	Defined "urban farm" and permitted use (updated 2011, 2013)	City of Austin
	S.M.A.R.T. Housing program	Encourage mix-income development	Provides incentives for developers, such as fee waivers and expedient review; 15,321 units have been constructed	City of Austin, Austin Housing Finance Corporation, others
	Mueller Eco-District	Redevelop former Robert Mueller Municipal Airport into mix-use eco-district	Initiated grassroots coalitions, the $265 million project is financed via FIF and public revenue bonds received LEED silver for Neighborhood Development	City of Austin, Catellus, ROMA Design
	Austin Energy's GreenChoice Program	Allow residential and commercial customers to purchase renewable wind power	Subscribers pay $.0075 per kilowatt hour (updated 2014)	Austin Energy
2002	Greenbuild Conference	Promote networking and information sharing about green construction	Hosted first USGBC national conference	City of Austin, USGBC
2004	Austin City Hall	Build a green city hall building	Built to LEED Gold standards, over 50 percent of the building was constructed with recycled materials, and it features solar panels, a rooftop garden, and more	City of Austin, Urban Design Group, Cotera and Reed Architects, others
	Opportunity Austin	Foster job-creating investment in Austin	Is a five-year, five-county economic development initiative, which has added an estimated 190,000 new jobs (updated 2009, 2014)	Austin Chamber of Commerce
	University Neighborhood Overlay program	Encourage affordable housing around UT campus	Provides incentives for developers, such as density bonuses; 117 units have been constructed	City of Austin
	Transit Oriented Development Ordinance	Maximize access to public transit and support smart growth	Eight districts adopted the ordinance in anticipation of the MetroRail	City of Austin

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
2005	Plug-In Partners	Support mass production of plug-in hybrid vehicles	Austin Energy provided $1 million in seed money for initial purchase of plug-ins (movement went national in 2006)	City of Austin, Alliance to Save Energy, Clean Air Collation, more
2006	Austin Climate Protection Plan	Combat climate change by reducing emissions citywide	The five-point plan, which involved over 700 participants, included: municipal operations, Austin Energy, home and building efficiency, community buy-in, and going carbon neutral	City of Austin, UT, Austin EcoNetwork, Austin Interfaith Network, TX Climate and Carbon Exchange, GACC, others
2007	Municipal Plan	Make City operations carbon-neutral by 2020	Update codes and developed programs to reduce energy use	City of Austin
	Big-Box Ordinance	Limit big-box development	Retail development over 100,000 square feet must have public and city council review	City of Austin
2008	Energy Conservation Audit and Disclosure Ordinance	Audit energy use for nonresidential facilities	Requires energy audits for municipal and other nonresidential building (updated 2009 to include residential homes)	City of Austin, Austin Energy
	City of Austin's Single-Stream Curbside Recycling	Introduce single-stream recycling	72 percent residential participation with 60 percent of potential recyclables recycled	City of Austin, Balcones Resources
	Austin/Travis County Food Policy Board	End health disparities, ensure food justice, and ensure community leadership	Volunteer citizen board that analyzes, monitors, and recommends improvements to local food system	City of Austin, Travis County
	Seaholm Eco-district	Redevelop former municipal power plant into mix-use eco-district	Of the $150 million public-private development project, the City's investment capped at $17.7 million	City of Austin, Seaholm Power Development
2009	Recycled Reads	Recycle discarded books and divert waste from landfills	Collects from 20 City locations and the community, processing 12 to 15 tons of materials per month	City of Austin, Goodwill Central Texas
	City of Austin's Sustainable Urban Agricultural and	Establish a single-point of contact and streamline process for establishing community gardens via Sustainable	Over 100,000 pounds of fresh, local, organic produce is produced yearly	City of Austin

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
	Community Garden Program	Urban Agriculture and Community Garden Ordinance		
	Green Boots	Provide education on green construction for residential contractors	Is a multi-session program with over 50 contractors participating annually	City of Austin, Home Builders Association of Greater Knoxville
	Austin Bicycle Master Plan	Create a protected active transportation network	Launched City's Active Transportation program, and greatly improved bicycle network via bike lanes (updated 2014)	City of Austin, Austin Bicycle Advisory Council
	Pecan Street Research Institute	Establish consortium to conduct utility-related research	Via $4 million grant from Texas Emerging Technology Fund, it conducts research in 10 states	UT, Texas Emerging Technology Fund, Dell, Intel, 3M, others
2010	City of Austin's Office of Sustainability	Enable effective leadership across the City's more than 40 departments	Official office was established	City of Austin
	Hornsby Bend Biosolids Management Plant Update	Update Technology and double composting capacity	Via $31.8 million in stimulus funding, also built electricity generator powered by methane produced by plant	City of Austin, EPA
2011	Austin Resource Recovery Master Plan	Aims for zero waste, keeping at least 90 percent of waste out of landfills by 2040	Outlined aggressive milestones, which included a full cycle, up- and down-stream, plan	City of Austin
	City of Austin's Green Business Leaders Program	Encourage business practices that protect the environment and save money	186 members have pledged to green their business in: energy, water, waste, and/or transportation	City of Austin
	The Downtown Austin Plan	Establish action priorities for developing a sustainable downtown	The plan has over 100 recommendations, and implementation plans are underway	City of Austin, Downtown Austin Alliance, ROMA Austin
	Municipal Solar Program	Install PV system on George Washington Carver Museum and Library	Via $363,250 DOE grant, 105 kW system installed	City of Austin, DOE
2012	Imagine Austin	Update *Austin Tomorrow* and develop a comprehensive development plan	Identified eight priority areas: health, creative economy, connectivity, codeNEXT, water, environment, affordability, and workforce	City of Austin, CAMPO. Austin Creative Alliance, Austin Equation, Bootstrap Austin, Livable City, others

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
	Colony Park Sustainable Community Initiatives	Develop sustainable mixed-use, mixed-income on public land	Cia $3 million HUD Challenge grant to engage community and develop master to develop 208 acre tract inspired by HUD Livability Principles	City of Austin, HUN, Colony Park Neighborhood Association, Pecan Street, UT, others
	City of Austin's Universal Recycling Ordinance	Support City's goal of zero waste by 2040 by mandating recycling	Requires businesses and multi-family complexes to recycle	City of Austin, Balcones Resources
	Lake Travis Stem Academy	Provide K-9 with STEM-based experimental learning	Is a private school serving 30 local kids	Experimental Science Education Research Collaborative, Culture Booster
2013	City of Austin's Single-Use Carryout Bag Ordinance	Support the City's goal of zero waste by 2040 by banning plastic bag use	Austinites use 200 million fewer plastic bags annually, a 75 percent reduction	City of Austin, Keep Austin Beautiful, Texas Retailers Association
	The Watershed Protection Ordinance	Creek and floodplain protection	A series of stakeholder meetings were held and a Green Infrastructure Working Group was formed to implement green stormwater infrastructure	City of Austin, Save Our Springs Alliance, others
	Pike Power Plant	Facilitate research commercialization in Central Texas	Is a development of Pecan Street Inc., an energy research consortium	City of Austin, UT, Austin Chamber of Commerce
	Austin STEM Academy	Provide pre-school students with problem-based learning	Provides STEM-based education for two- to five-year olds	EGBI
	CodeNEXT	Update the City's Land Development Code, which determines how land can be used	Several City departments, a volunteer Advisory group, and consultant team are engaging the public to review the code	City of Austin, Opticos Design
	2012 International Energy Conservation Code	Implement new building codes per the Austin Climate Protection Plan	Adopted with local amendments	City of Austin
2014	[re]Manufacturing Hub	Create an economy of scale in the transformation of recyclables into new products	A $1 million EDA grant funded the development of the City's first eco-industrial park and job center for recycling, reuse, and repair industries	City of Austin, EDA, TXP, Inc.
	City of Austin's I want to be Recycled campaign	Support the City's goal of zero waste by 2040 by raising public awareness	Distributed education materials to schools and civil organizations, and	City of Austin, Keep Austin Beautiful, Ad Council

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
			advertised in diverse media outlets	
	Austin Materials Marketplace	Support the City's goal of zero waste by 2040 by facilitating business-to-business material reuse	Via an online database, materials needed and available are posted and traded	City of Austin, Ecology Action of Texas, U.S. Business Council for Sustainable Development
	City of Austin's Shop Zero Waste	Support the City's goal of zero waste by 2040 by encouraging residents to shop at local businesses that sell recycled items	Shoppers can search over 100 local businesses at LocallyAustin.org	City of Austin
	City of Austin's Curbside Organic Collection Pilot	Support the City's goal of zero waste by 2040 via composting	Nearly 14,000 households participate, and private company takes scraps at no-cost	City of Austin, Organics by Gosh
	Green Alley Demonstration Project	Develop green alley to demonstrate regenerative design principles	Via community needs assessment and public workshops a demonstration alley was selected and redesigned	City of Austin, Guadalupe Neighborhood Association, UT, others
	Recycling Innovations Investment Forum	Showcase City's growth potential for recycling and green-collared jobs	23 local, national, and international investors attended to hear business pitches from 10 companies	City of Austin
	City of Austin's Complete Streets program MetroRapid	Support Imagine Austin by improving citywide walkability and bike-ability Provide express service	Initiated Streets for People, a Green Streets working group, and more Offers express routs to create a fast alternative for commuters	City of Austin; CodeNext City of Austin, Capital Metro
	Project Connect	Identify short- and long-term solutions to transit problems, and funding options	An in-depth study that involves stakeholder involvement in underway	City of Austin, CAMPO, AECOM
	2040 Metropolitan Transportation Plan	Develop a regional multi-modal transportation plan	The 20-year plan proposed called for expanding bus and rail systems, new roads, educational initiatives, and more	CAMPO, City of Austin, City of Round Rock, others
2015	City of Austin's Fixit Clinics	Support the City's goal of zero waste by 2040 by encouraging residents to repair broken items	Community-led clinics consist of volunteer coaches who help residents fix broken items	City of Austin, Reuse Alliance, Skillshare Austin
	[re]Verse Pitch Competition	Bolster materials reuse as a new form of social entrepreneurship	Eight social entrepreneurs competed for $10,000 prize	City of Austin, U.S. Business Council of Sustainable Development,

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
				Impact Hub, others
	Rocky Mountain Institute's (RMI) Mobility Transformation	Address congestion by enhancing transit information via mobility app	RMI conducted a national search and chose Austin because of its cooperative government and entrepreneurial culture	RMI, City of Austin, City of Denver
	Property Accessed Clean Energy (PACE) program	Provide low-cost, long-term loans for efficiency projects	Voted in by Travis County, the first in TX to do so	Petros PACE Finance, Keeping PACE

Appendix O. Timeline for Chicago's Green Economy Development

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
1992	City's Department of Environment	Establish department to oversee green initiatives	Sadhu Aufochs becomes the City's first Chief Environmental Officers	City of Chicago
	Bike 2000 Plan	Develop plan to increase bike ridership and improve infrastructure	Establishes a network of 114 miles bike places, 50 miles of trails, and 10,000 bike racks (updated 2015)	City of Chicago
1993	CitySpace plan	Develop plan to create and preserve open space	Via Chicago Community Trust grant, plan targets neighborhoods, greenways, lakefront, downtown, and more	City of Chicago, Chicago Public Schools, Forest Preserve District of Cook County, others
	Chicago Brownfield Initiative	Remediate and redevelop brownfields	Nearly 900 acres have been returned to productive use	City of Chicago
1994	DOE Chicago Area Clean Cities	Advance energy, economic, and environmental security through local programs and policy	Via $15 million DOE grant, voluntary coalition works to education public and support officials	City of Chicago, DOE, Nicor Gas, Nissan, Cook-IL Corporation, others
	Greencorps Chicago	Provide job training to residents with employment barriers	Partners locally to provide nine-month green job training	City of Chicago
1996	Neighbor-Space	Support community-based management of urban green spaces	Works with community groups to provide materials, funding, technical assistance, and training	City of Chicago, Forrest Preserve District of Cook County, Chicago Park District
1999	Green TIME Zone	Redevelop older communities into environmentally improved, desirable neighborhoods	Identify, organize, and mobilize public and private resources to create and expand businesses	Chicago's Southland Economic Development Corporation
	Chicagoland Entrepreneurial Center	Promote and grow startup community	Offers workspace, networking events, and other resources	Chicagoland Chamber of Commerce
1998	Open Space Impact Fee Ordinance	Raise funds for land acquisition and park improvements	Fees, ranging from $313- $1,253, are allocated from residential developments	City of Chicago
	Chicago River Corridor Development Plan	Develop framework to revitalize the Chicago River	Goals include: create greenway, restore and protect natural habitats, develop as a recreational site, and encourage economic development	City of Chicago

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
2001	Urban Heat Island Initiative	Reduce urban heat and improve air quality by promoting green-roof systems	Via $2.5 million EPA grant, built green roof on City Hall (concluded 2002)	City of Chicago, EPA
	Chicago Energy Conservation Code		Mandates reflective roofs	City of Chicago
2002	Chicago Center for Green Technology	Remediate brownfield and provide resources for green technology and design	Via $9 million HUD grant, LEED-certified center provided educational programming, R&D (closed 2014)	City of Chicago
	The Chicago Central Area Plan	Develop plan for economic success downtown	Identified sustainable strategies for open spaces, transit, and more	City of Chicago
2004	American Wind Energy Association Conference and Exhibition	Bring together industry and business leaders to exhibit and discuss wind energy	World's largest annual wind energy event (hosted again in 2009, 2013, and 2018)	City of Chicago
2005	Green Exchange	House green businesses in a green building to support green customers	Is the nation's largest sustainable business community	Baum Development, The Commission on Chicago Landmarks, others
	Green Permits Program	Incentive program to encourage developers to incorporate green design	Locally funded, offers expedited permit process for applications that include green technologies	City of Chicago
	Chicago Waste-to-Profit Network	Divert waste from landfills, reduce energy and emissions, create jobs	Funded by the City, State grant, and company matching fee, has $17 million estimated economic impact	City of Chicago, Chicago Manufacturing Center, others
	Green Roofs and Cool Roofs Grant program	Encourage construction of green roofs	Offers residents, businesses, and small developments up $6,000 in rebates (completed 2009)	City of Chicago
2006	Building Green Chicago Conference and Expo	Join community leaders for educational seminars and to network	Annual conference to promote sustainable building	City of Chicago
	Market Barriers to Green Development Initiative	Identify and address market barriers to green development	Developed committee that identified impediments, and developed strategy to eliminate barriers	Delta Institute, EPA, Northeast-Midwest Institute
	Chicago Conservation Corps	Recruit, train, and support volunteers to improve quality of life in Chicago	Provide leadership, teaching, and community resources through a variety	City of Chicago, Peggy Notebaert Nature Museum

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
		neighborhoods	of programs	
	Adding Green to Urban Design strategy	Develop comprehensive implementation strategy for sustainable urban design	Via meetings between eight City departments, public agencies, and over 50 professionals, the plan includes strategies for streets, landscapes, sidewalks, alleys, and more	City of Chicago
	Chicago Nature and Wildlife Plan	Establish framework to protect and expand area's ecosystems	Identified and developed plan for 98 sites and over 4,800 acres (updated 2011)	City of Chicago, Forest Preserve District of Cook County, others
	Green Alleys Program	Ameliorate stormwater problems via green infrastructure	Over 200 green alleys have been installed, which include permeable pavements, open bottom catch basins, high-albedo pavement, and more	City of Chicago
	Complete Streets Policy	Develop citywide multimodal transportation system	Mandates all users be accommodated in transportation projects	City of Chicago
	Construction and Demolition Ordinance	Divert waste from landfills	Requires contractors to keep 50 percent of waste out of landfills via recycling or salvage	City of Chicago
	Green Roof Improvement Fund	Incentivize green roofs for owners of existing downtown buildings	Matched building owners up to $100,000 per project	City of Chicago
2007	Green Region Compact	Improve the region's air, water and land, reduce greenhouse gases, minimize waste, and reduce energy consumption	Over 100 mayors signed the voluntary compact at the Metropolitan Mayors Caucus's Business Meeting	City of Chicago
	Chicagoland Green Collar Jobs Initiative	Develop a skilled workforce to meet demands for a growing GE	Hosts annual Green Collar Jobs Summit, developed weatherization curriculum, distributes information	Chicago Jobs Council, City of Chicago, Blacks in Green, others
	Eat Local Live Healthy plan	Coordinate local and regional food industry to enhance health and business	Identified strategies to improve food quality and access while lowering cost	City of Chicago
	Blue Cart Recycling	Implement single stream recycling	Introduced in seven communities and citywide in 2013	City of Chicago, Waste Management, Sims Metal Management Municipal Recycling

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
	Stormwater Ordinance	Better manage stormwater via the deployment of green infrastructure	Requires large developments to capture the first half-inch of rainfall onsite	City of Chicago
	CoolGlobes: Hot Ideas for a Cooler Planet	Increase public awareness about climate change	Used public art to inspire civic engagement	City of Chicago
2008	Chicago Climate Action Plan	Reduce greenhouse gas emissions	Multi-stakeholder task force examined City's risk to climate change and made recommendations	City of Chicago
	Sustainable Development Policy	Promote green building practices	Supports LEED certification, Energy Star, Chicago Green Homes certification, and more	City of Chicago
2009	Chicago Clean Power Coalition	Build a green economy in Chicago	Advocacy group to pass a "Clean Power Ordinance" requiring plants to reduce emissions (completed 2013)	IL Environmental Council, IL Public Interest Research Group, others
	Chicago Green Homes Program	Encourage builders, developers, and homeowners to build green	Three-tiered home certification program	City of Chicago
	Green Office Challenge	Citywide competition to reduce energy consumption in commercial buildings	Participants are evaluated through a "Green Office Scorecard"	City of Chicago, others
	DOE SunShot Initiative	Transform City into a national leader in rooftop solar photovoltaic development	Via $750 thousand DOE grant, developed solar installer certification and training program and more	City of Chicago, DOE
	Reconnecting Neighborhoods plan	Transform how public and affordable housing are integrated into their neighborhoods	Funded by the Regional Transportation Authority, makes recommendations to reconnect the City	City of Chicago, Metropolitan Planning Council, Regional Transportation Authority, others
	Transit Friendly Development Guide	Encourage smart development along CTA's 144 rail stations	Identified zoning and infrastructure assets and models for growth	City of Chicago
	Low-Cost Weatherization and Education Program	Encourage residential weatherization	C3 volunteers facilitate workshops and give out weatherization kits	City of Chicago, Chicago Conservation Corps (C3)
2010	Mayors Climate	Recognize mayors for innovative	Mayor Richard M. Daley was awarded	U.S. Conference of Mayors,

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
	Protection Award	practices to improve efficiency and reduce emissions	for the City's CCAP	City of Chicago
2011	Chicago Sustainable Industries	Support City's manufacturing sector in global economy	Via $60 thousand EDA grant, examined effectiveness of manufacturing districts, set infrastructure and business priorities	City of Chicago, U.S. Economic Development Association (EDA)
	Energy Efficiency Grant Agreement	Fund energy efficiency projects in Chicago	$11 million investment to retrofit City buildings	City of Chicago, State of IL
	Green Taxi Grant Program	Increase the number of hybrid and alternative fuel vehicles	Via $1 million in ARRA funds, reimburse the cost of alternative vehicles for taxi fleet	City of Chicago
	Healthy Chicago	Conduct epidemiologic study to set baseline for developing policies and programs and tracking progress	Led to the creation of the citywide 2013 *A Recipe for Healthy Places* plan	City of Chicago, Chicago Department of Public Health, others
	Chicago Sustainable Industries plan	Develop a business plan to expand sustainable manufacturing base	Via $692,000 HUD grant, three study was conducted resulting in 2013 plan	City of Chicago, HUD
	Chicago Zoning Ordinance	Update ordinance to support growth in urban agriculture	Revised code greatly reduced regulations	City of Chicago, Advocates for Urban Agriculture, others
	Energy Infrastructure Modernization Act	Update ComEd's infrastructure	Illinois General Assembly gave ComEd $1.3 billion for smart grid improvements	Illinois General Assembly, ComEd
2012	Building a New Chicago	Revitalize city infrastructure and create 30,000 new jobs	Funded by the new Chicago Infrastructure Trust, $7 billion program to retrofit buildings, create new bus loop, and more	City of Chicago
	Green Business Chicago	Certifies companies that meet green standards	Provides decal demonstrating support for green practices	City of Chicago
	DOE Better Buildings Challenge Partner	Reduce GHG emissions by 20 percent by 2020 via city government leadership	To date, annual energy cost savings of $2.5 million and emission reductions equivalent to 5,800 cars	City of Chicago, DOE
	Sustainable Chicago 2015	Establish City as a hub for GE development, improve energy efficiency and transportation	Task force offered incentives, metrics, and strategies to update Chicago Climate Action Plan	City of Chicago

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
	1871	Support digital startups	Provides workspace, seminars, mentorship, and more	Chicagoland Entrepreneurial Center
	City of Chicago Cultural Plan 2012	Strengthen and expand the City's cultural and creative capital, helping make it a global cultural destination	Via research and assessment, public engagement, and visioning forums, the plan details 10 priorities, 36 recommendations, and more	City of Chicago, The Chicago Community Trust, Illinois Arts Council, others
	Chicago Regional Green Transit Plan	Provide roadmap for how transit can improve the City's sustainability	Quantified the benefits of public transit and identified strategies to reduce green house gas emissions	Chicago Transportation Authority, Regional Transportation Authority, Metra, Pace
	Chicago Forward	Develop two-year action plan	Set aggressive goal of eliminating all traffic fatalities in 10 years	Chicago Department of Transportation
	Retrofit Chicago	Support *Sustainable Chicago 2015* by driving energy efficiency improvements	Consists of residential, commercial, and municipal programs	
	Make Way for People program	Contribute to City culture and placemaking	Allows for the establishment of people spots (i.e., parklets), people streets, people alleys, and people plaza	Chicago Department of Transportation
	Chicago Infrastructure Trust	Provide funding for transformative infrastructure projects	Offers innovative financing strategies to attract capital from investors	City of Chicago
2013	Energy Benchmarking Ordinance	Raise awareness of energy performance	Buildings larger than 50 thousand square feet must track energy use	City of Chicago
	Divvy Bike Share	Provide citywide bike-sharing program	Funded by the City and with federal grants, bike system has 4,760 bikes and 476 stations	City of Chicago, Motivate, USDOT
	The 606	Develop a new system of parks, access points, and the elevated multi-use Bloomingdale Trail	Is a public-private partnership development that connects four neighborhoods	The City of Chicago, The Trust for Public Land, Friends of the Bloomingdale Trail, others
	Sustainable Backyard program	Promote environmentally-friendly landscapes and encourage rain barrel use	Offers residents rebates of up to 50 percent for local purchases	CDOT, Center for Neighborhood Technology
	A Recipe for Healthy	Develop a strategy to improve food	Input from over 400 professionals,	City of Chicago, Windy

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
	Places	access and quality while supporting food businesses	advocates, residents, and more resulted in six-prong strategy	City Harvest, Enlace Chicago, others
	Farmers for Chicago program	Promote urban agriculture in low-income neighborhoods	Via $300,000 National Institute of Agriculture grant, vacant city-owned lots, technical assistance, and training was provided for organizations to start an urban farm	City of Chicago, National Institute of Agriculture, Growing Powers, Walgreens, Iron Street Urban Farm, others
2014	Rain Ready Initiative	Manage flooding and drought	Funded by the City and private foundations, provides rainwater management, educational workshops	Center for Neighborhood Technology, City of Chicago
	Solar Chicago	Make rooftop solar more affordable for residents	Via World Wildlife Fund Earth Hour Capital Grant, offers installation discounts	City of Chicago, Cook County, Vote Solar Initiative, others
	Green Stormwater Infrastructure Strategy	Increase use of green stormwater infrastructure	Developed five-year plan for $50 million investment	City of Chicago
	Green Healthy Neighborhoods plan	Improve food access and quality in Chicago's south side	Transform the blighted community into an eco-district by promoting urban agriculture	City of Chicago, Chicago Metropolitan Planning Agency, others
	Farmers' Market Promotion program	Support farmers' markets in low-income neighborhoods	Via a $88,908 USDA grant, three farmer markets were supported	City of Chicago, USDA
2015	Faith and Sustainability Forum	Promote climate action among Chicago's faith communities	Held sessions on peer-to-peer sharing and action planning	Institute of Cultural Affairs, Chicago Sustainability Leaders Network
	Fresh Moves Mobile Markets	Provide affordable, locally-sourced food to underserved areas	Funded for first year by City, operates year-round, five days a week	Growing Power, City of Chicago
	Drive Clean Chicago	Support *Sustainable Chicago 2015* via innovative incentive program	$11,295,000 program offers vehicle and station rebates	Chicago Department of Transportation, CALSTART, Chicago Area Clean Cities Coalition
	Sustainable Operations plan	Institutionalize sustainable practices for City facilities	Includes standards for cleaning, pest management, supply procurement, more	City of Chicago

Appendix P. Timeline for Little Rock's Green Economy Development

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
2002	Johnson Control, Inc. Contract	Improve energy efficiency of City facilities	Manages efficiency of City facilities	City of LR, Johnson Control
2005	Sustainable Buildings Ordinance	Institutionalize sustainable practices in municipal buildings	All new constructions and major renovations are to meet LEED standards	City of LR
	Clinton Presidential Center	Construct LEED-certified headquarters	The Center is LEED-Silver certified and features a green roof, solar panels, and more	Clinton Foundation
	Winrock International Headquarters	Construct LEED-certified headquarters	The headquarters is LEED-Gold certified and features a green roof, solar panels, rainwater catchment, and more	Winrock International
2007	Energy Efficiency Makeover	Help customers commit to energy efficiency	Annual contest that awards 17 customers up to $5,000 in efficiency improvements	Arkansas Electric Cooperative Corp.
	Little Rock Technology Park		$22 million	UALR, UAMS, City of LR, LR Chamber of Commerce, AR Children's Hospital
2008	Woodland Edge	Promote low impact development throughout the neighborhood	First U.S. neighborhood to receive four-star rating under the National Green Building Standard	Rocket Properties
	Central Arkansas Green Agenda	Develop and support projects that protect the environment and contribute to long-term economic vitality	Coordinate: green transportation, land use and growth management, energy efficiency, and the environment	Metroplan
	Mayor's Sustainability Commission	Advise City on sustainable practices	Founded the Little Rock Sustainability Summit, developed a sustainable purchasing policy, and more	City of LR
	Johnson Control, Inc. Contract	Collect and sell methane from landfill to local businesses	$7 million performance contract signed for methane gas recovery system	City of LR, Johnson Control
	Green Built Arkansas	Establish comprehensive green building program and demonstration home	The program was the first in the state, and the demonstration home was constructed at Woodland Edge in 2009	Home Builders Association of Greater LR
2009	Green Building Financial Incentive Program	Provide financial incentives to build green	Via DOE stimulus grant, awards up to $1,500 for each building Project	City of LR, DOE

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
			(completed 2012)	
	Sustainable Business Network of Central Arkansas	Support development of sustainable business community	Established local chapter of the Business Alliance for Local Living Economies	The Green Corner Store, Mesa Landscape Architects, others
	Sustainability Summit	Promote green efforts inside the City	Annual summit of City's green leaders	City of LR
2010	Growing Arkansas' Green Economy Conference	Support advocacy and participation in growing the GE	Provided opportunity to network and learn with sustainability experts	Pulaski County
	The Job's Not Done Tour	Highlight potential to create good jobs by passing U.S. climate change legislation	Hosted bus tour, which visited 30 cities in 17 states in three weeks	BlueGreen Alliance
	Rock Island Bridge Project	Renovate bridge connecting LR and N. LR	Via $2 million EDA grant, renovations include a pedestrian and bicycle bridge	City of LR, EDA
	Little Rock Livable Neighborhoods Initiative	Address aging housing stock by rehabilitating or demolishing homes	Via $8 million HUD grant targeted three areas: Downtown/Midtown, Southwest LR, and North LR	City of LR, LR Housing Authority, Black Community Developers, Habitat for Humanity, HUD
	Little Rock Serves Initiative	Boost community engagement and volunteerism	Via Cities of Service Leadership grant, conducted needs assessment and identified challenges that could be addressed via targeted volunteerism	City of LR, Bloomberg Philanthropies, Rockefeller Foundation
2011	Arkansas Advanced Energy Association	Grow green economy by expanding energy workforce and manufacturing base	Coalition of 13 partners that provide networking and advocacy for members	Pew Charitable Trusts, Arkansas Green Energy Network, others
	Arkansas Public Fleet Managers Association Conference	Promote collaboration between fleet managers	Two-day conference on sustainability, alternative fuel vehicles and hybrid options	City of LR
	Creative Corridor on Main Street project	Help state capitals vision greening their neighborhoods	Via $150,000 National Endowment for the Arts grant, provided technical assistance to design green infrastructure project on Main Street	City of LR, EPA, Arkansas Natural Resource Commission (ANRC), Marlon Blackwell Architect, Township Builders, others
	Mayor's Car-Free	Reduce vehicle transportation in City	Annual challenge for residents to not	City of LR

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
	Challenge		drive for one week	
	Single-Stream Recycling Program	Provide single-stream recycling for cities' residents	Landfill rates have dropped five percent and recycling rates increased 39 percent	City of LR, City of N. LR, Sherwood, Waste Management
	Healthy Food Summit	Address the local food shed	Planned by 35 local organizations, the summit brought together leaders to discuss food access and develop policy	City of LR, UAMS, Heifer International, Philander Smith College, others
2012	Arkansas Delta Green Expo	Increase awareness GE and support green entrepreneurs	Provides workshops, presentations, and vendor booths related to energy efficiency, renewable energy, and more	Arkansas Economic Development Commission
	City of LR Compressed Natural Gas Fueling Station	Reduce energy use and emissions, create jobs	Via $1.3 million in grant and City funds, added CNG to an existing fuel station	City of LR, DOE, Southwestern Energy
	Green Drainage Project	Build a demonstration site to manage stormwater on Main St.	Via $900,000 EPA grants and City funds, to study green infrastructure	City of LR, EPA, ANRC
	City Sustainability Officer	Establish position to focus solely on sustainability efforts	Housed in the Public Works Department	City of LR
	EPA Environmental Workforce Development and Job Training	Train low-income residents on brownfield assessment and cleanup	Via $200,000 EPA grant, 90 students received 124 hours of training	Arkansas Construction Education Foundation
	Volunteer Park Ranger Program	As identified in the Little Rock Serves Initiative, recruit "Goodwill Ambassadors" to maintain green spaces	Park rangers were trained traffic control, CPR, and more and deployed in eight City parks	City of LR, Audubon Arkansas, others
2013	Rock Street Pocket Housing	Construct an affordable and green housing project in low-income neighborhood	Via National Endowment for the Arts grant and City funding, the $1.3 million project constructed 16 homes and included several green designs	U of A Community Design Center, City of Little Rock, Downtown Little Rock Community Development Corporation, others
	Love Your School Obesity Initiative	Combat childhood obesity via education and volunteerism as identified in the Little Rock Serves Initiative	Funded by a $100,000 Bloomberg Philanthropies grant, nutritional curriculum and 300 campus gardens were established	City of LR, Heifer International, AR Hunger Relief Alliance, Home Depot, U of A, others

Year	*Name*	*Mission*	*Actions*	*Major Actors Involved*
	City Aid project	Construct bike lanes in Creative Corridor	Via $460,000 AR Highway and Transportation Department, bike lanes were constructed in 15 blocks	City of LR, AR Highway and Transportation Department
2014	Farmers' Market Promotion program	Increase the availability of fresh and healthy local foods	Via $99,983 USDA grant, Winrock International provides market management and farmer training	Winrock International, USDA
	2009 International Energy Conservation Code	Establish minimum energy requirements for new constructions	Adopted by the City	City of LR
	Creative Citymaking project	Enhance streetscape along Creative Corridor	Via $360,000 ArtPlace America grant, signage and artwork were added	City of LR, ArtPlace America
2015	Arkansas River Resource Center	Establish a sustainable port	Via $960 thousand EDA grant, built new, green headquarters, passed sustainability resolution	LR Port Authority, EDA
	City of LR Energy Improvement District	Provide energy improvement financing	Gave residents access to PACE financing	City of LR
	12th St. Police Station	Build a green station	Via $12.5 million in bonds and a one percent sales increase, it is the first City-built LEED-certified building	City of LR
	Drain Smart Program	Raise awareness and protection of local streams	Coalition uses art to communicate importance of river care	City of LR, Audubon AR, Keep LR Beautiful, others
	Transportation Alternatives Program (TAP) grant	Support alternative transportation initiatives	Via $360,000 TAP grant and $90,000 in matching funds, Rock Region Metro will install 25 solar-powered shelters	Rock Region Metro, TAP
	The Silver Mine	Develop resource center for entrepreneurs	Center was established at the Argenta Innovation Center via $1 million EDA grant	AR Regional Innovation Hub, EDA
	Organic Composting Pilot program	Establish composting demonstration program	UAMS implemented it at its cafeteria and donated 12 tons of waste in first 12 months	UAMS, Organix

Appendix Q. Comparison of Actors in Stakeholder Groups per Case

Stakeholder Group	*Austin*	*Chicago*	*Knoxville*	*Little Rock*
Agriculture	Austin Community College Austin Permaculture Guild Austin-Travis County Food Policy Board Compost Coalition Compost Peddalers Texas A&M Extension Service Urban Roots	Advocates for Urban Agriculture Center for Urban Transformation Chicago Food Policy Action Council Chicagoland Permaculture Community Resource Development Greencorps Neighbor Carts The Roof Crop	Nourish Knox Knoxville Permaculture Guild Knoxville-Knox County Food Policy Council Three Rivers Market University of Tennessee Extension Service	Arkansas Food Policy Council Arkansas Sustainability Network Heifer International Little Rock Urban Farming University of Arkansas Extension Service Winrock International
Construction	Austin Community College Austin Entergy Center for Maximum Potential Building Systems CleanFund Commercial PACE Capital U.S. Green Building Council, Balcones Chapter	Ashrae Chicago Center for Green Technology ComEd Elevate Energy John Lang LaSalle Neighborhood Technology Center U.S. Green Business Council, Illinois Chapter	Knoxville Utility Board Knoxville-Knox County Community Action Committee Pellissippi State Community College Tennessee Valley Authority U.S. Green Building Council, E. Tennessee Chapter	Arkansas Electric Cooperative Corp. Entergy Home Builders Association of Greater Little Rock Pulaski Technical College U.S. Green Building Council, Arkansas Chapter
Research Commercialization	Austin Energy Austin STEM Academy Austin Technology Council Dynastatica Enable Impact GirlStart IBM, Austin The Greater Austin Chamber of Commerce	Argon National Laboratory Austin Polytechnial Academy Chicago Department of Science and Technology Chicagoland Chamber of Commerce Google	Career Magnet Academy Knoxville Chamber of Commerce Knoxville Entrepreneurial Center Pellissippi State Community College Oak Ridge National Laboratory	Arkansas STEM Coalition Clinton Foundation East Initiative Little Rock Regional Chamber University of Arkansas, Little Rock University of Arkansas Medical Sciences

Stakeholder Group	*Austin*	*Chicago*	*Knoxville*	*Little Rock*
	Tri Environmental and Company	Northwestern University	Tennessee Valley Authority	Winrock International
	University of Texas	UI Labs	University of Tennessee	
		University of Chicago		
Transportation	Austin Rail Now	Chicago Department of Aviation	Knoxville Area Transit	Metroplan
	Capital Area Metropolitan Planning Organization	Chicago Department of Transportation	Knoxville Regional Transportation Organization	Rock Regional Metro
	Capital Metro	Chicago Metropolitan Agency for Planning	Knoxville-Knox County Community Action Committee	
	Central Austin Community Development Corp.	Chicago Transit Authority	The Metropolitan Planning Commission	
		Motivate		
		PACE		
		Regional Transportation Authority		
Waste Management	Austin Zero Waste Alliance	Chicago Resource Center	Knox Compost	Pulaski County
	Balcon Resources	Citizens Against Waste Disposal	Knox County	Waste Management
	Organics by Gosh	Our Roots	Waste Connections	Organix
	Reuse alliance, Texas Chapter	People for Community Recovery		University of Arkansas Medical Sciences
	State of Texas Alliance for Recycling	Waste Management		
	Travis County			

Vita

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