

Considerations for Informed Pursuit of Zero Waste: Lessons from Two Case Studies

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Abstract

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ABSTRACT

Starting in the early 2000s, a number of U.S. communities have adopted “zero waste” commitments to reduce waste as much as possible through recycling, composting, and other means. Little in-depth information exists about the impetus for or efficacy of these efforts. The author sought to build knowledge on the topic by conducting case studies of two communities: the zero waste efforts of Boulder, Colorado, and the Zero Waste Zones established in Atlanta. The two cases presented an interesting contrast, in terms of sector driving zero waste: public in Boulder, and private in Atlanta. The study aimed to use the experiences of these two communities, supplemented with background research on materials management and application of relevant theory, to develop a set of considerations for more informed pursuit of zero waste.

The author gathered qualitative data by conducting unstructured interviews of the actors involved with the zero waste efforts in Boulder and Atlanta. Interview questions concerned, e.g., zero waste goals and plans, the impacts of zero waste on the business or organization, and influential individuals or organizations.

The study produced the following set of considerations: Definition of waste determines priorities and impacts of zero waste efforts; responsibility for waste arbitrarily resides with consumers and local government instead of producers; the private, public, and nonprofit sectors each play important roles in waste reduction; local government should not bear the full burden of materials management; and state and federal government can offer useful policy tools to advance zero waste.

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1. Introduction

1.1. Problem Statement

Starting around the early 2000s, scattered localities and organizations in the United States began to adopt goals, resolutions, and/or plans that incorporated the term “zero waste”—enough to suggest a micro-trend in urban and regional waste-management planning. At this point little information exists on why zero waste efforts have emerged now, whether all localities and groups adopting them are adhering to the same set of guiding principles, what factors encourage or discourage these efforts, and what their impacts are over the short and long terms.

Handling of solid waste is very much a local function since its collection and disposal occur in the communities where consumers live. Accordingly, a shift to more recycling and less landfill disposal—as zero waste implies—will affect and be affected by inherently local concerns like land use regulation and infrastructure development, along with the public resource commitments these entail. At the same time, external factors like state and federal policy and market demand can wield tremendous and often unappreciated influence over success or failure of local efforts. Therefore, communities and other groups interested in pursuing zero waste in some form need to understand the challenges and opportunities arising from the often complex interplay of factors both within and beyond their control.

Currently, while zero waste features occasionally appear in the news media and trade publications and older zero waste websites exist but are in sore need of updating, there are few resources for those seeking in-depth storytelling and analysis of experience with zero waste planning and implementation in U.S. communities.

1.2. Aim and Scope

The aim of this thesis is to develop a set of considerations to help those interested in pursuing zero waste make the most informed decisions possible about their courses of action.

The two case studies whose lessons attempt to fulfill this aim contain important differences that define the scope. In the United States there is a persistent tension—often expressed through political ideology—between those who believe that the private sector, acting as it does through market transactions, is best equipped to meet the needs of the population and handle problems of social or environmental concern, and those who believe that this is true only for the public sector with its access to the tools of government. The case study locales were specifically chosen for this thesis based on each appearing to represent one of these two viewpoints, according to a preliminary review of facts gathered from media accounts of their stories. Thus Boulder, Colorado (both city and county), was chosen for its emphasis on government policy tools including resolutions, strategic plans, and taxation, and the Zero Waste Zones effort in Atlanta, Georgia, was selected because it was initiated and managed by the local hospitality industry that apparently perceived economic benefit from waste reduction.

1.3. Overview

Chapter 2 provides background information on the concept of zero waste, examples of zero waste and other waste-reduction practices in the United States and other countries, the current state of materials management in this country, and problems associated with waste.

Chapter 3 describes the research methods used to conduct the case studies.

Chapters 4 and 5 present the two case studies: zero waste in the city and county of Boulder, Colorado, and the Zero Waste Zones of Atlanta, Georgia. Timelines of important events are provided in tables near the beginning of each case study. Each chapter ends with its own discussion section analyzing the case in depth.

Chapter 6 draws relevant lessons from the case studies and presents them as a set of considerations to assist with an informed approach to zero waste.

Note: In-text citations of interviews conducted for this thesis take one of two simplified forms:¹ (1) attribution to the interviewee's name within the sentence, or (2) the interviewee's initials and the word "interview" within parentheses at the end of a sentence. No other citation elements are included since the interview transcripts are not publicly available. Information within the text that was obtained from published sources (e.g., newspaper articles, websites, or books) is cited according to American Psychological Association publication style guidelines, as required by Virginia Tech's Department of Urban Affairs and Planning.

¹ The author received permission to use these alternative citation forms from the American Psychological Association publication style experts on March 28, 2013.

2. Background

This chapter introduces and defines the concept of zero waste, describes some examples of zero waste-like practice in the United States and around the world, provides a brief overview of waste generation and management in the United States, and ends with a discussion of problems related to waste.

2.1. Defining Zero Waste and How To Achieve It

2.1.1. A movement leader's five tenets

Eric Lombardi, executive director of the influential community recycler that will be introduced in the Boulder case study, is a theorist in the zero waste movement. In 2001 he wrote an article for *BioCycle* magazine (a publication for the composting and renewable energy industries) arguing for a new approach to reducing waste. Lombardi pointed to citizen-led movements around the world protesting groundwater and air pollution associated with landfills and waste incinerators, rising waste production despite increases in recycling rates, and also to a growing recognition that the recycling-focused movement of the 1990s was “only an end-of-pipe solution to a problem that has its beginning at the front end of the pipe ... on the designer's desk” (Lombardi, 2001, p. 75). He asserted:

Waste is not inevitable—waste is the result of bad design, and ultimately, the result of bad decision-making. The idea of “designing waste out” of our world is a dramatic paradigm shift in how we value and manage our natural resources, and we've given the idea a name: “Zero Waste ... or Darn Near.” (p. 75)

Lombardi outlined five tenets of zero waste: (1) “redesigning products and packaging,” (2) “producer responsibility,” (3) “investing in infrastructure, not landfills or incinerators,” (4) “ending taxpayer subsidies for wasteful and polluting industries,” and (5) “creating jobs and new businesses from discards” (2001, p. 76). “Responsible waste management is a combination of market forces and public policy. It's a social issue; it's not a pure market issue,” he maintained; “I'm a great believer in the private sector but the government sets the rules about what it expects from recycling. The government has to step up” (“Coloradans Environmentally,” 1999; Prendergast, 2007).

A sidebar to the *BioCycle* article quotes Bill Sheehan, executive director of the GrassRoots Recycling Network (GRRN): “the greatest impediment to achieving Zero Waste communities in the United States at this time is the lack of producer responsibility for their product and packaging waste” (Goldstein, 2001, p. 75). In a statement somewhat radical among environmental advocacy groups for its upstream rather than downstream focus on pollution and waste, Sheehan asserted, “the burden of herbicide tainted compost products should not fall upon a local government or composting facility owners/operators but rather upon the manufacturer of the herbicide product” (p. 75). As covered in the Boulder case study, GRRN initiated campaigns against big beverage companies to pressure them into voluntarily taking greater responsibility for waste associated with their products.

2.1.2. *Cradle to Cradle*

Producer responsibility became an increasingly common theme in waste-reduction discussion. A year after Eric Lombardi's five tenants article came out, *Cradle to Cradle: Remaking the Way We Make Things* was published—the popular book by architect Bill McDonough and chemist Michael Braungart which, despite not using the term “zero waste,” similarly called for producer responsibility and product redesign in service of waste reduction. The authors advocated a shift from the conventional “cradle-to-grave” principles of making products that are ultimately discarded and polluting, to a “cradle-to-cradle” (C2C) ethic that would eliminate waste (2002). Ideally, products would be made from “technical nutrients” (p. 93) like polymers and metals that can be reclaimed and reused infinitely with no loss of function or quality, and “biological nutrients” (p. 93) that can be returned safely to the earth. For architecture, they proposed constructing buildings as living organisms adapted to the local environment, with features like vegetated roofs and heating/cooling systems that make intelligent use of available energy flows of sun and wind. C2C would avert what the authors termed “intergenerational remote tyranny” (p. 114) of the present generation impairing the material, physical, and economic well-being of future ones.

But while Lombardi argued for government intervention, notably absent from *Cradle to Cradle* was acknowledgement of any constructive role for government in what its authors called the “next industrial revolution” (p. 6) based on closed-loop material flows (McDonough & Braungart, 2002). It appeared that the authors saw government as capable of serving only as an accomplice in today's wasteful and harmful production processes. McDonough and Braungart (2002) contend:

Regulation is a signal of design failure. In fact, it is what we call a *license to harm*: a permit issued by a government to an industry so that it may dispense sickness, destruction, and death at an ‘acceptable’ rate. (p. 61)

The authors argued that if buildings, products, and processes were designed up front to be non-polluting and beneficial to the environment, then there would be no harmful byproducts (air and water pollution, solid waste) to regulate (McDonough & Braungart, 2002). But it is unclear how a critical mass of producers can be persuaded to voluntarily adopt design and production standards that would make government regulation unnecessary.

C2C author Bill McDonough makes an effort to appeal to corporate audiences with his message; his book recounts some successes in that regard, and it ends with five ways that his target audience—presumably those in C-level positions—can change their business practices to accord with C2C principles (2002). These five ways are: (1) “signal your intention” (“commit to a new paradigm, rather than to an incremental improvement of the old”) (p. 182); (2) “restore” (“strive for ‘good growth,’ not just economic growth”) (p. 183); (3) “be ready to innovate further” (“no matter how good your product is, remember that perfection of an existing product is not necessarily the best investment one can make”) (p. 184); (4) “understand and prepare for the learning curve” (“recognize that change is difficult, messy, and takes extra materials and time”) (p. 184); and (5) “exert intergenerational responsibility” (p. 185). All five principles seem to rely exclusively on action of the enlightened businessperson, within the

sphere of commerce—with no role for government. But as will be seen in the case study discussions, the Porter Hypothesis suggests that well-designed environmental regulation is a critical driver of change in business practice that can also advantage early adopters of that change.

Thus Lombardi's five tenets of zero waste and McDonough and Braungart's C2C prescriptions agree on the ends but clash somewhat on the means. As will be seen in the two case studies, these issues of whether and how responsibility for sound materials management should be distributed among the private, public, and non-profit spheres emerge as dominant themes.

2.2. Current Zero Waste Practice

2.2.1. United States

The term “zero waste” is a relatively new addition to the materials-management lexicon. The localities in the United States that adopted rigorous waste-reduction measures early on did not call it “zero waste” but took the course out of necessity, given economic or geographic conditions.

Nantucket

One such community is the town of Nantucket, Massachusetts—an island located 30 miles off the east coast with a year-round population of 10,000 and 40,000-50,000 tourists in the summer (Town of Nantucket, n.d.). The island's popularity strained its solid waste infrastructure to the point where, in 1994, the state mandated that it close its landfill and ship its trash to the mainland, which would have increased trash bills fourfold (Waste Options, Inc., n.d.). Nantucket's local government decided on a different course of action: In 1997 it contracted with Waste Options, Inc., to develop a comprehensive solid-waste management system based on recycling (including hard-to-recycle items and construction/demolition debris), composting, and even mining the island's landfill to recover recyclable materials (Waste Options, Inc., n.d.). Central to the system is a cylindrical, rotating digester that combines organic residuals in the waste stream (mainly food scraps) after all recyclables have been removed, mixes them with biosolids from the wastewater treatment plant, and allows bacteria to break down the material (Subler, 2009). The resulting product then undergoes an aerated curing process and is later mixed with yard waste to form compost for landscaping and gardening use on the island (Subler, 2009). Today, Nantucket's recycling rate stands at 90 percent (Waste Options, Inc., n.d.).

Seattle

Seattle is another locality whose zero waste path started with a landfill problem. In 1986, the city's last landfill closed and use of the closest facility in King County tripled Seattle's waste disposal costs (Seattle Public Utilities, n.d.). Today Seattle must export its garbage on a daily basis to a landfill in eastern Oregon via a mile-long train; Seattle's City Council President, Richard Conlin, called this “an astonishing thing to have to deal with” (Democracy Now, 2009). Particularly noteworthy about the city's response is how it turned a waste-management problem into an environmental-protection opportunity: Seattle developed an urban composting program that reduced municipal waste volume but also provided a valuable product for local pollution control. A chronic problem for the city is stormwater runoff that

pollutes waterways, erodes streambeds, and damages aquatic habitat—especially that of the region’s coho salmon. In 2009, Seattle revised its Stormwater Code to require use of soil “best practices” in green stormwater infrastructure (City of Seattle, n.d.). Now the city requires new construction sites to use compost-amended soil, explaining that “Amending construction-disturbed soils with compost re-establishes a healthy soil ecosystem, which provides increased treatment of pollutants and sediments. It also supports healthy plant growth, minimizing the need for fertilizers and pesticides, thus reducing pollution through prevention” (City of Seattle, 2009, p. 1). Seattle also saves about \$10 per ton by composting instead of landfilling its organic waste (Cohen, 2010).

Table 1: United States Localities with Zero waste Commitments

California
Berkeley
Burbank (informal)
Del Norte County
Oakland
Palo Alto
San Bernardino County Zero Waste Communities (informal)
San Diego County (citizens advisory committee)
San Francisco (city and county)
San Luis Obispo County
Santa Cruz (city and county)
Sonoma County (local task force, citizens committee)
State of California, Integrated Waste Management Board
Other States
Austin, TX
Boulder (city and county), CO
Carrboro, NC
Central Vermont Waste Management District
Kaua’i, HI
New York City, NY (citizen ZW plan developed but not adopted by city)
San Antonio, TX
Seattle, WA
Summit County, CO

Source: Zero Waste International Alliance. (2013, February 16). Zero Waste Communities [Web page]. Retrieved from <http://zwia.org/news/zero-waste-communities/>

San Francisco

San Francisco is perhaps the most widely-recognized “zero waste” community in the United States, boasting the highest diversion rate (percentage of the waste/material stream that is not landfilled) of any North American city, 80 percent (City and County of San Francisco, Office of the Mayor, 2012). But the original impetus did not come from the city; instead, it came from a 1989 California state law, the Integrated Waste Management Act, which set waste diversion goals for cities and counties: 25 percent by 1995 and 50 percent by 2000 (Tam, 2010). It was “the most aggressive waste diversion law in the country ... motivat[ing] public and private investment in California’s waste management infrastructure” (Tam, 2010). The state helped to create new markets for recycled materials by adopting recycled-content purchasing agreements for its agencies and creating Recycling Market Development Zones

providing loans and other assistance to certain manufacturers that use recycled material in their products (Tam, 2010). San Francisco took unusual measures to meet and surpass state waste reduction targets; in 1997 it became the first major U.S. city to introduce curbside composting (CalRecycle, n.d.). The city has set for itself a zero waste goal of 100 percent by 2020 (City and County of San Francisco, Department of Public Works, 2012). Part of what makes San Francisco's efforts possible might be its unique relationship with the local waste hauling company, explored further in the discussion section of the Boulder case study.

In recent years (the 2000s), more localities are using the term "zero waste" as they plan for unusually ambitious waste reduction goals. Table 1 lists communities with civic entities that have made commitments, e.g., resolutions or strategic plans, that incorporate the term "zero waste." Notably, more than half are in California, likely attributable to the state's stringent 1989 law setting waste-diversion goals for its local governments.

2.2.2. International

Rigorous waste reduction occurs in many locations around the world, very often for practical reasons. Below are summaries of noteworthy efforts beyond the United States. Some efforts are distinguished by national or state coordination that results in practice more integrated into economic and environmental planning than anything presently in the United States.

Singapore

The urbanized and industrialized island city-state of Singapore, with a population of 5 million people already densely packed on just 714.3 km² (275.8 square miles), faces a land shortage that has required it to find alternatives to landfilling its waste (Republic of Singapore, 2012). As characteristic of a country with a rising population and standard of living, Singapore continues to increase the amounts of waste disposed (2.80 million tons in 2001 to 2.86 million tons in 2011)—but it has also seen a greater increase in recycling: 2.23 million tons in 2001 to 4.04 million tons in 2011 (Republic of Singapore, 2012; Zhang et al., 2010). Today Singapore relies on recycling and incineration as its primary means of waste disposal (Republic of Singapore, 2012). (Incineration is generally opposed by zero waste advocates, particularly in the United States, who argue, among other points, that it removes valuable material from cycles of production and produces toxic ash [Platt, 2004]). But the Singapore government has signaled a shift in strategy away from dealing with waste only after it is generated; for example, the country now requires contractors working on large government projects to be ISO-14001-certified to minimize waste produced through design and construction (Teo, 2007). As reported by the chief engineer for waste minimization at Singapore's National Environment Agency (NEA):

Singapore is taking a big leap forward to achieving the ultimate goal of 'Towards Zero Landfill.' And it is not resting on its achievements so far. The next step is to raise the bar by striving for zero waste. This means moving upstream to avoid waste at source and bringing the producers of waste on board to collaborate with the NEA and the community to reduce waste. (Teo, 2007)

Australia

Australia is engaging in significant waste-reduction effort, although on a regional basis at this point with no guiding national strategy. Some Australian localities and states have adopted their own plans. For example, in the late 2000s, the five regional councils in the metropolitan area of Perth, the capital city of the country's largest state, Western Australia, planned to develop new infrastructure to recycle nearly 100 percent of the municipal solid waste stream (Oakes, 2008). One impetus came from concerns about declining quality of the region's topsoil, which could be improved with organic material recovered from waste as demonstrated in successful trials on area farmland (2008). Earlier in the decade, Western Australia adopted a guiding principle, "towards zero waste by 2020" (p. v), and established roles for different sectors—including requiring private industry to take responsibility for product lifecycles through regulation based on the polluter pays principle, extended producer responsibility, and application of incentives and coercive powers (Government of Western Australia, 2003). It is unclear at this point whether or how effectively these strategies have been implemented, but clearly this Australian state has gone further than any U.S. counterpart in just the sheer range of policies it is considering in its approach to zero waste. In marked contrast to the *Cradle to Cradle* ethos, the state of Western Australia asserts that for zero waste, "There is need for Government leadership and a clear vision of the long-term alternative" (p. 37).

Europe

Many countries that do not use the term "zero waste" to describe their efforts nevertheless have adopted important "upstream" elements of the concept—in particular, extended producer responsibility (EPR, or PR). European attempts to establish EPR specifically for electronic and electrical equipment (EEE) started in the early 1990s with a draft ordinance in Germany, with eventual expansion of policy development to the level of the European Union (EU) (Lindhqvist & Lifset, 2003). In 2003 the EU adopted the Waste Electrical and Electronic Equipment (WEEE) Directive which requires that member countries achieve collection, recycling, and recovery targets for electronic waste—without charging consumers (Dempsey et al., 2010).

The EU also manages end-of-life-vehicles (ELVs)—vehicles that have reached the end of their useful product lives—using EPR under a directive issued in 2000 (Forslind, 2005). The directive contains six provisions that govern various aspects of ELV management, including: dismantling facility specifications; mandates for recovery, recycle, and reuse ratios of vehicle components; prohibition of use of lead, chromium, and mercury in most materials; requirements for the producer to cover all or much of the dismantling costs (which allows take-back free of cost to the vehicle's last owner); and requirements for enforceable agreements between national authorities and industries involved in ELV EPR. Today most European countries have their own ELV policies in place for implementing the EU directive, and most are voluntary.

Japan

Japan has significant experience with an EPR system. Several environmental constraints and problems, including scarce landfill space, concerns about hazardous emissions like dioxin from toxic waste disposal,

and high dependence on raw material imports, pressured Japan over the past two decades to seek a solution in EPR (Ogushi & Kandlikar, 2007). Between 1995 and 2003 Japan adopted eight laws to advance the social and technological changes necessary to address its material challenges.

Japan's EPR system is based on the "shared-responsibility principle" (p. 4507) that assigns roles to various groups (Ogushi & Kandlikar, 2007). For example, the home appliance recycling law specifies that retailers collect products that have reached the end of their useful lives, consumers pay the costs associated with transportation and recycling, and producers recycle the returned products (2007). Recycling and transportation fees are collected at different points for different items: at the time of purchase for new computers and cars, and at disposal for home appliances (2007).

Overall, Japan's EPR system is very successful at recycling material that has been collected, but collecting all recyclable material can be challenging (Ogushi & Kandlikar, 2007). The system's fees for certain goods—particularly for home appliances for which fees are collected at disposal—provide some negative incentives that reduce recycling rates: illegal dumping and exporting of end-of-life products for scrap mean that collection efficiencies are about 50 percent for manufactured goods. In the case of automobiles, which the ELV recycling law facilitates, owners can deregister their ELVs without paying a recycling fee and transfer the car to illegal recyclers who export the vehicles as scrap metal to meet growing global demand.

Ogushi & Kandlikar (2007) identify some key strengths of the Japanese EPR system. First, division of responsibilities among different groups, along with mandatory take-back policy, can reveal inefficiencies in material recycling collection. Second, the laws recognize and provide for different post-market conditions in different industries—and these laws are reviewed and adapted as conditions change.

An important third strength is that the system helps promote technological innovation in resource recovery. After enforcement of the EPR laws began, the country experienced successful recycling of collected material due mainly to industry's response of investing in R&D and establishing a dedicated recovery infrastructure. Individual manufacturing industries have built disassembly and recycling facilities all over the country for cars, computers, and appliances, and in addition to recycling technology, vehicle manufacturers have invested in applications for recycled materials. Say Ogushi and Kandlikar: "These advances could give Japan a competitive edge if more countries and jurisdictions demand recycling technologies" (p. 4506). In addition to encouraging improvements in recycling technology, Japan's laws are improving product design—one of the major goals of EPR. Producers that are responsible for product waste and set up facilities to collect and process it receive feedback from those facilities that encourage them to redesign their products for easier disassembly, material separation, and recycling (Dempsey et al., 2010).

Fourth, while disposal costs are higher in Japan than in the EU, Japan's costs are coming down—attributable in part to the shift of recycling responsibility from municipalities to the private sector for certain products. For example, the average cost of recycling air conditioners by the Tokyo government was \$144, but declined to \$52 after the home appliance recycling law was enforced (Ogushi & Kandlikar, 2007).

As the Boulder case study will show, zero waste advocates in the United States consider EPR an important component of their agenda, but at this point there is no clear plan on how to achieve it in this country on a broad scale.

2.3. The State of Waste and Recycling

Before delving into the two case studies, it is helpful to take an objective look at the current state of U.S. waste more generally: the sources of waste and amounts generated, how the materials are handled, and the merits of recycling vs. disposal.

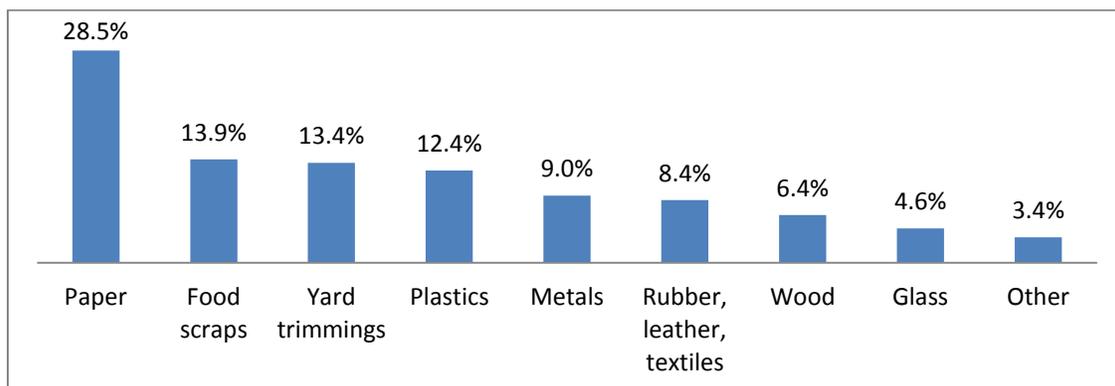
2.3.1. Sources of waste

Residential and commercial: Municipal solid waste

Municipal solid waste (MSW) comprises both residential and commercial refuse (and usually excludes construction and demolition debris), with residential accounting for between 55-65 percent and commercial for 35-45 percent depending on location (U.S. EPA, 2011). According to the U.S. Environmental Protection Agency (EPA), generation and disposal of MSW have changed between 1980 and 2010: Solid waste generation increased from 3.66 to 4.43 pounds per person per day (down from a high of 4.72 in 2000), but recycling also increased from less than 10 percent to 34 percent of MSW generated (2011).

Figure 1 breaks down by percentage the materials that make up the MSW stream.

Figure 1: Composition of MSW by Material Type (before recycling), 2010



Source: U.S. Environmental Protection Agency (EPA). (2011). *Municipal solid waste generation, recycling, and disposal in the United States: Facts and figures for 2010* (EPA-530-F-11-005). (Chart generated by author.)

Industrial

The term “industrial waste” as used here covers the unwanted by-products of manufacturing (Porter, 2002). This type of waste receives so little attention in the United States as to be nearly invisible—except when large amounts of it are at the center disasters like the 2008 coal ash spill in Tennessee that

released 5.4 million cubic yards of sludge laden with the coal-combustion byproduct broke free of its containment pond (Dewan, 2008). Industrial waste is generally disposed of in private, on-site impoundments instead of MSW landfills (MacBride, 2012).

Other sources of producer-generated, unwanted by-products are agricultural and mining. As noted by Porter (2002), the relatively unregulated wastes from these two sources impose severe external costs. Almost half of the water pollution in the United States is attributable to agriculture (particularly manure lagoons associated with feedlots and agricultural chemical runoff) and mining waste, which also can bury and contaminate surrounding ecosystems (Porter, 2002).

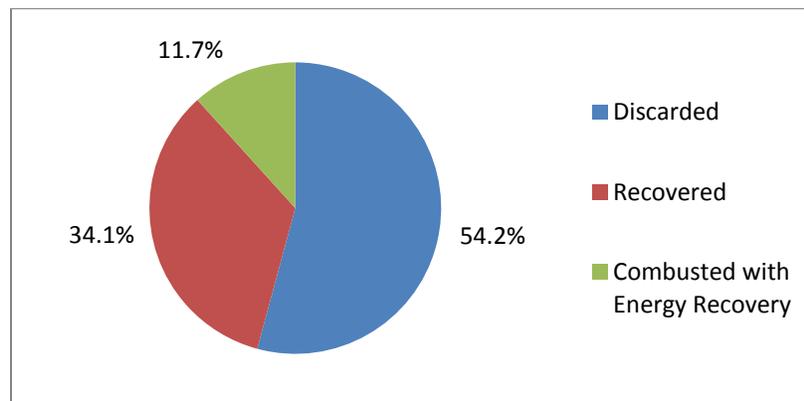
According to MacBride (2012), the EPA does not track industrial waste as systematically as it does municipal solid waste although her research has found that the annual tonnage of the former is “an order of magnitude” (p. 88) greater than tonnage of MSW.

2.3.2. *Methods of materials management*

Landfill disposal

As Figure 2 shows, most MSW generated in the United States is still discarded in landfills. A smaller portion is recycled or composted and 1a still-smaller portion is incinerated.

Figure 2: Management of MSW in the United States, 2010



Source: U.S. Environmental Protection Agency (EPA). (2011). *Municipal solid waste generation, recycling, and disposal in the United States: Facts and figures for 2010* (EPA-530-F-11-005). (Chart generated by author.)

Events in the 1980s and 1990s fueled the perception of a dwindling supply of landfill space, including the 1987 media spectacle of the *Mobro 4000* garbage barge traveling up and down the east coast unable to offload its cargo of trash (not, as it turns out, due to a lack of landfills but to “an unsuccessful deal between a Long Island Mafia boss ... and an inexperienced barge owner” [p. 12] that left the barge without a signed disposal agreement [Ackerman, 1997]). The backgrounds of the case studies detail changes in national environmental regulations that also raised concern about landfill space and contributed to the growth in recycling programs. But today, capacity generally is not a major problem associated with landfills; according to the EPA (2011), “While the number of U.S. landfills has steadily

declined over the years, the average landfill size has increased. At the national level, landfill capacity appears to be sufficient, although it is limited in some areas” (p. 10).

Recycling

There are approximately 9,000 curbside recycling programs in the United States, an increase from 8,875 in 2002 (U.S. EPA, 2011). The number of community composting programs has declined, though, from 3,227 to 3,090 in 2010 (U.S. EPA, 2011). Organic materials account for the bulk of MSW, chiefly paper, food scraps, and yard trimmings. Recovery as a percentage of weight generated is 62.5 percent for paper, 57.5 percent for yard waste, and only 2.8 percent of food waste (U.S. EPA, 2011). For metals this figure is 35.1 percent, and for glass, 27.1 percent.

Porter (2002) finds that, based on direct cost-benefit analysis, the per-ton cost of collecting recyclables generally is two to three times as expensive as trash collection. This is attributable to several factors: Tipping fees—the charge to waste haulers of dumping trash at landfills—vary with location but are often low; trash trucks generally can collect more material per run than recycling trucks because the former can compact the loads during collection and the latter cannot; and the costs of operating a materials recovery facility (MRF) that processes recyclables are often not covered by revenue earned by material sales (Porter, 2002). The Boulder case study in particular explores these challenges.

But there are other costs and benefits to consider, namely the externalities associated with virgin material extraction and production that are not directly captured in a market transaction, such as loss of environmental services and social costs (Porter, 2002). One externality of more concern recently is greenhouse gas emissions, which contribute to climate change. According to the EPA (2011), recycling and composting of materials “provides an annual benefit of more than 186 million metric tons of carbon dioxide equivalent emissions reduced, comparable to removing the emissions from over 36 million passenger vehicles” (p. 10).

Porter (2002) predicts that the economics of recycling likely will improve: “Over time, the benefits of recycling will grow, and its costs will fall” (p. 139). The reasons for this include improvements in collection program efficiency as localities gain more experience and learn from one another, better MRF technology, and growth in markets for recyclable materials (Porter, 2002). All these factors feature in the case studies.

An interesting question is why so many local governments have implemented a recycling program if so many of them stand to lose money from it. Kinnaman (2005) identified three possible motives: (1) economic—recycling programs reduce landfill disposal costs and generate revenue from material sales (but, he notes like Porter [2002] that collection and processing costs very often exceed revenues); (2) directives from the state legislature—states are bigger than municipalities and thus more likely to internalize the social costs of trash disposal by mandating recycling programs or setting state goals to encourage behavior; and (3) “perhaps most importantly, municipal governments may have implemented recycling programs in direct response to local tastes for recycling among their own residents” (p. 1).

Kinnaman's (2005) study found that municipalities with recycling programs "are responding to the preferences of local households ... [that have expressed an] altruistic distaste for garbage generation" (p. 21). Ackerman (1997) also describes recycling behavior as essentially altruistic. The cultural roots of this recycling-directed altruism are explored in the discussion section of the Atlanta case study.

MSW management and prospects for change

Spiegelman and Sheehan (2005) of the Product Policy Institute contend that municipal solid waste management (MSWM) as most commonly practiced in North America has acted to subsidize current wasteful material flows:

MSWM has been ineffective in reducing product waste generation and disposal, and in sustaining increases in product recycling, because waste prevention lies outside of the MSWM system. Instead, the provision of universal collection and disposal of product wastes created conditions that made the Disposable Society a natural response to the laws of the market. Over the course of the 20th Century, MSWM provided services that acted as a perverse subsidy to the production of short-lived products and facilitated the excessive material flows that characterize our consumer society. The MSWM system, originally configured to manage a waste stream made up of relatively homogeneous materials such as ash and biowastes, lacks the capability to effect reverse logistics for complex products. With product waste recovery stalled and the proportion of waste discarded still at around 70 percent, MSWM practitioners are increasingly focusing on optimizing waste disposal systems. By pursuing energy recovery from mixed waste, MSW practitioners are conceding defeat in the goals established in the 1980s to stem materials flows and conserve resources. (p. 2)

Spiegelman and Sheehan (2005) blame two U.S. policies for nearly extinguishing the formerly widespread system for collecting and refilling beverage containers. First, federal development of the interstate highway system reduced the costs of one-way shipping from distant bottling plants to the point where local plants were unnecessary. Second, MSWM systems accepted these bottles at no cost to the producer. The sunk costs of both government and producers in the responsibilities they have accepted for different stages of material flow present barriers to change.

2.4. The Problem of Waste

While landfill capacity is generally not a significant problem in the United States and environmental laws passed in the late 20th century have greatly reduced landfills' contributions to groundwater pollution (further discussed in both case studies), new concerns associated with waste have emerged, primarily its contribution to climate change, resource depletion, and newly-recognized forms of pollution. These concerns are briefly examined below.

2.4.1. Waste and climate change

As climate change has risen to a pressing concern among environmentalists in the industrialized world, waste-reduction advocates increasingly highlight the contribution of garbage to greenhouse gas (GHG)

emissions. For example, in 2008, a group of environmental organizations, including the Institute for Local Self-Reliance and Eco-Cycle, issued their *Stop Trashing the Climate* report urging a zero waste agenda to reduce GHG emissions (Platt, Ciplet, Bailey, & Lombardi, 2008). In 2009, a representative from the Institute for Local Self-Reliance (an organization working against incineration of trash, among other issues) gave a presentation on the connections between waste and climate change at the Zero Waste Conference in Devens, Massachusetts, in 2009 (Platt, 2009).

Waste—using the EPA’s narrow definition—generates GHGs in several ways. The lack of oxygen present in landfills causes decomposing organic matter to release methane, a greenhouse gas 21 times more effective than carbon dioxide in trapping atmospheric heat over a 100 year period (U.S. EPA, 2013). According to the EPA, waste decomposition in landfills is the second-leading source of methane related to human activity in the United States, nearly equaling emissions from the digestive fermentation of ruminant livestock (U.S. EPA, 2013). While some landfill gas is flared to reduce its heat-trapping potential (combustion converts methane to carbon dioxide) or captured through landfill gas recovery systems, significant amounts still escape (U.S. EPA, 2013). This controversy is explored in the Atlanta case study.

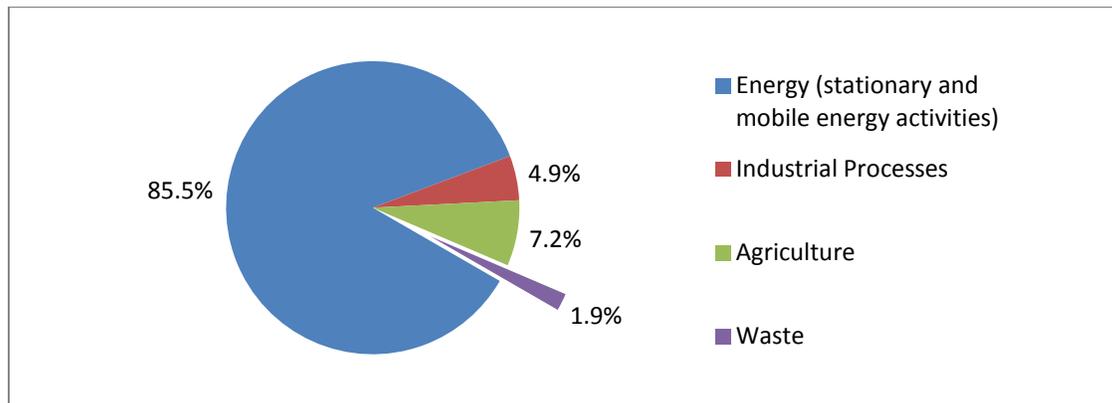
Composting of organic wastes generates mostly carbon dioxide, but adequate aeration of organic matter as it decomposes, as occurs with proper composting, avoids production of more potent methane gas that these same materials would generate in landfills (US Composting Council, 2008).

Some waste is also incinerated, but the EPA includes those emissions under its energy sector data because waste incineration is used to produce energy (U.S. EPA, 2013).

As valid as the waste-GHG connection is, the contribution of waste to overall production of greenhouse gas emissions should be placed in context of other sources. Figure 3 uses the EPA’s data and definitions (the agency uses sector definitions developed by the Intergovernmental Panel on Climate Change) to depict waste’s contribution to total U.S. GHG emissions. “Waste” comprises three categories of activity: landfills, wastewater treatment, and composting (U.S. EPA, 2013).

As the figure shows, waste processing and disposal are relatively small contributors to total greenhouse gas emissions in the United States. This suggests that targeting the waste sector for GHG reduction likely is not the most effective use of public resources.

True zero waste principles encourage a broader definition of waste to include not only downstream sources but also all those that occur upstream during production. Ideally the portion of a GHG inventory attributable to waste would include a breakdown of all types of waste produced in upstream processes (not just industrial landfill waste as is now included), but that would be nearly impossible to calculate since it would require highly subjective measures of what constitutes waste. For example, if a manufacturer is choosing to use older, more inefficient technology in production when newer, more efficient technology exists, should the difference in GHG emissions be considered waste? Even more judgmentally and controversially, unnecessary consumer purchases—including the industrial processes required to produce them and the miles traveled to distribute and retrieve them—and unnecessarily large, energy-inefficient residential and commercial buildings might also be considered waste.

Figure 3: Contribution of Sectors to Total U.S. GHG Emissions, 2011

Source: U.S. Environmental Protection Agency (EPA). (2013). *DRAFT inventory of U.S. greenhouse gas emissions and sinks: 1990-2011*. (Chart generated by author; percentages do not add to 100 due to rounding.)

2.4.2. Waste and resource depletion

Resource optimists

If concern for resource limits is a spectrum, at one end are the optimists who maintain that there is no reason to concern ourselves with future material scarcities because advances in technology can solve any problem we might encounter. Solow (1993) argues:

Resources are ... fungible in a certain sense. They can take the place of each other. That is extremely important because it suggests that we do not owe to the future any particular thing. There is no specific object that the goal of sustainability, the obligation of sustainability, requires us to leave untouched. (p. 181)

The authors of *Cradle to Cradle* could be considered technological optimists. Unlike most environmentalists who urge restraint in consumption habits, McDonough and Braungart (2002) argue that there is no need to sacrifice if goods and services are produced in ways that eliminate their destructive, depleting consequences:

The key is not to make human industries and systems smaller, as efficiency advocates propound, but to design them to get bigger and better in a way that replenishes, restores, and nourishes the rest of the world. Thus the “right things” for manufacturers and industrialists to do are those that lead to good growth—more niches, health, nourishment, diversity, intelligence, and abundance—for this generation of inhabitants on the planet and for generations to come. (p. 78)

Resource pessimists

At the other end of this concern spectrum are the pessimists. As Daly (1991) notes, “The economy grows in physical scale, but the ecosystem does not. Therefore, as the economy grows it becomes larger in

relation to the ecosystem. Standard economics does not ask how large the economy should be relative to the ecosystem” (p. 180). Daly proposes a sustainable model, the steady-state economy, which has constant stocks of people and materials but no such constants for knowledge, technology, and distribution of income and resources. Unlike Solow, he asserts that many of nature’s services cannot be replaced by man-made services.

Also occupying this end of the spectrum is Richard Heinberg’s *Peak Everything: Waking Up to the Century of Declines*, which warned of impending, devastating drops in fossil fuel supplies, fresh water availability, agricultural yields, economic activity, mineral extraction, and climate stability (2010). But grouping together all these conditions clouds the issue because some conditions are clearly more imperiled than others. For example, despite many environmentalists’ insistence on dwindling oil supplies, we are now more capable than ever of exploiting formerly hard-to-access deposits. The International Energy Agency (IEA) projected in its *World Energy Outlook 2012* that at the start of the next decade, the United States will overtake Saudi Arabia as the world’s largest oil producer because of improvements in extraction technology.

The biggest problem with petroleum actually may be that the world will not run out of it soon enough—at least not before a far more serious problem associated with oil use, its contribution to greenhouse gas emissions, threatens the ability of humans to inhabit vast areas of the planet. The IEA (2012) warns, “No more than one-third of proven reserves of fossil fuels can be consumed prior to 2050 if the world is to achieve the 2° goal [of limiting planetary warming to a scientifically-accepted maximum safe level], unless carbon capture and storage (CCS) technology is widely deployed” (p. 3). Far from sounding an alarm about oil shortages, the IEA’s 2012 report urges that concern be directed to water, since “water needs for energy production are set to grow at twice the rate of energy demand” (p. 7) and “water is growing in importance as a criterion for assessing the viability of energy projects as population and economic growth intensify competition for water resources” (p. 7).

Another important resource often overlooked in the alarms over Peak Oil is phosphorus—one of the three macronutrients (along with nitrogen and potassium) required for healthy plant life. Normal nutrient cycling from decomposition of organic matter or, domestically, application of compost, is enough to replenish soil, but conventional, industrial-scale agriculture relies on huge quantities of mined phosphorous (Elser & White, 2010). However, as Elser & White (2010) reported in *Foreign Policy*:

Our supply of mined phosphorus is running out. Many mines used to meet this growing demand are degrading, as they are increasingly forced to access deeper layers and extract a lower quality of phosphate-bearing rock (phosphate is the chemical form in which nearly all phosphorus is found). Some initial analyses from scientists with the Global Phosphorus Research Initiative estimate that there will not be sufficient phosphorus supplies from mining to meet agricultural demand within 30 to 40 years.

The phosphorus problem suggests that, absent the unlikely event of newly-discovered, accessible phosphate deposits, the scale and/or methods of agriculture will need to change. This issue also has implications for the definition of “waste” and prioritization of waste reduction activity.

2.4.3. Waste and pollution

Although landfill space is not currently a problem for most parts of the country, not all material discards that should end up in landfills actually do. One example that has received attention in recent years is the contamination of marine ecosystems with plastic, notably the floating garbage patch twice the size of Texas—doubling every decade—that has collected in an area of the Pacific ocean where wind and water currents create a whirlpool effect (Hoshaw, 2009). Five other patches exist in the world’s oceans, and the plastics in them break down into trillions of tiny fragments that absorb toxins that are later released into organisms that feed on them (Hoshaw, 2009).

Concern over plastic pollution and health hazards led a group of ten scientists to issue a public call, in the journal *Nature*, for plastic waste to be classified as hazardous (Rochman et al., 2013). The authors pointed out that plastics can be toxic themselves, exerting endocrine-disrupting effects, and can absorb other toxins—yet in major developed countries are still classified as solid waste together with benign materials like food scraps and yard clippings. Rochman et al. (2013) engage the precautionary principle and demand shifting burden of proof in their call for plastics regulation:

Our critics counter that without evidence of catastrophic harm to health or the environment, it is a stretch to equate plastics to CFCs and other substances classed as toxic. We disagree. We believe that manufacturers of plastic, along with the food and textile industries that rely heavily on it, should have to prove that their products and packaging are safe. Such demands are routinely made on the food and pharmaceutical industries by directives from numerous agencies, including the US Food and Drug Administration and the European Medicines Agency. (p. 170)

Even efforts to keep material within systems of production through recycling can present environmental contamination and health hazards. A serious problem is exposure of workers—often in developing countries, but also among vulnerable domestic populations—to toxins released during recycling of electronic waste. Organizations including the Basel Action Network (2002), Greenpeace (2005), and the U.S. Department of Justice’s Office of Inspector General (2010) have exposed the dangers e-waste workers face. These complicated issues of worker well-being and the often-competing imperatives of economic development are touched upon in the Boulder case study.

2.4.4. Waste and terminology

A different sort of problem with waste is the language surrounding it, which can confuse or limit discussion. For example, the term “zero waste” can cause unnecessary fixation on the impossibility of achieving it in a literal sense; as Eric Lombardi has noted, ““One-hundred percent is not the point. If anybody hangs on to that, they’re missing the point”” (Truini, 2001). Understanding that the term is intentionally provocative and not to be taken literally can help us move past its seemingly unrealistic goal.

One objective of this thesis is to encourage less use of the term “waste management” and its downstream (i.e., post-production) associations implying that unwanted or harmful material, or waste,

should necessarily result from production. Use of the term “waste” reinforces a mindset that limits the range of possible solutions, focusing on what to do with unwanted materials rather than preventing their creation in the first place or encouraging their treatment as valuable commodities. This mindset has implications for what parties are ultimately responsible for that waste, as the case study discussions will argue.

In an attempt to change the language used in broader discussion, this thesis often will use the alternative term “materials management”—a term adopted by the U.S. Environmental Protection Agency (EPA) in its own effort to shift away from a traditional waste-management orientation. As the EPA explains, materials management focuses on: “knowing and reducing the lifecycle impacts across the supply chain; using less material inputs (reduce, reuse, recycle); using less toxic and more renewable materials; and considering whether services can be substituted for products” (U.S. EPA, n.d.d). This intention closely mirrors the producer-focused ethos of *Cradle to Cradle*—a departure from the individual/household/local-government locus of responsibility for waste management in this country. Of course, using different terminology is just the first step; developing a plan for concrete change appears to be the greater challenge.

3. Research Design

The concept of zero waste is relatively new in the United States and few communities practice it. Accordingly there is little in the literature on the topic—a condition that this thesis attempts to improve by exploring two specific instances of local-level zero waste planning and implementation.

Given the nascent state of the topic and little existing information on it, the most suitable research method for this purpose is qualitative case study research. According to Gerring (2007), “case studies are more useful for generating new hypotheses, all other things being equal” (p. 38), and “case studies may be more useful than cross-cutting studies when a subject is being encountered for the first time or is being considered in a fundamentally new way” (40). Therefore, the case studies in this thesis do not seek to confirm or disconfirm hypotheses; rather, per categorization put forth by Denzin and Lincoln (2000), they are technically “instrumental” (p. 437) in that their analysis aims “to provide insight into an issue or to redraw a generalization” (p. 437).

There are two case studies in this thesis and together they make up a “collective case study,” wherein a “researcher may jointly study a number of cases in order to investigate a phenomenon, population or general condition,” and “they are chosen because it is believed that understanding them will lead to a better understanding, perhaps theorizing, about a still larger selection of cases” (Denzin & Lincoln, 2000, p. 437). In such studies, “individual cases in the collection may or may not be known in advance to manifest some common characteristic” (p. 437) and “they may be similar or dissimilar, redundancy and variety each important” (p. 437).

The author chose the two cases because they appeared to offer an interesting contrast in their approaches to zero waste, particularly with respect to driving sector: public in Boulder vs. private in Atlanta. The author also sought to add to the body of knowledge on zero waste practice in specific communities by studying two localities that had not received as much media attention for their zero waste activities as San Francisco and Seattle. In addition, Boulder and Atlanta currently are not pressured by a lack of landfill space or a state mandate for waste reduction, so in that way they are more like the average community in the United States than Seattle or any California municipality.

After selecting the case studies, the author conducted research using secondary sources (such as newspaper articles, blog posts, and planning documents) of the zero waste activity in each locality. The author then contacted figures central to each case and asked them to suggest people to interview who were associated with the zero waste effort. The author contacted these prospective interviewees with information on the study, obtained their written consent to participate, and conducted semi-structured, generally one-hour telephone interviews of each participant (see Appendix A for lists of interviewees and their dates of interview, and Appendix B for sample interview questions). All interviews were recorded and transcribed by the author. The resulting data were stored and analyzed using Dedoose online qualitative data-management software. All aspects of this study were conducted in accordance with the protocol approved by Virginia Tech’s Institutional Review Board.

4. Case Study 1: Zero Waste in Boulder, Colorado

The city and county of Boulder, Colorado, occupy a unique position in the U.S. zero waste movement. The locality might lack the size and renown of San Francisco, but Boulder can claim a pioneering history in community-based recycling initiated by a homegrown nonprofit, Eco-Cycle, that would become the largest of its kind in the country. Eco-Cycle is headed by activist and theorist Eric Lombardi who has helped to build the institutions and philosophy behind the emerging zero waste movement in the United States. Table 2 provides a condensed timeline of events relevant to the Boulder case.

4.1. Background

4.1.1. *The city and county of Boulder*

Boulder County is located in Colorado's most populous region, known as the Front Range, which abuts the eastern foothills of the Rocky Mountains. The City of Boulder is the county seat and its largest municipality, with a 2011 population estimated at 98,889 and median household income of \$54,051 (compared with \$57,685 for the state) (U.S. Census Bureau, n.d.).

The largest industry in the city is government, particularly research-based institutions, including the University of Colorado's flagship campus and more than a dozen federal research laboratories including the National Oceanic and Atmospheric Administration's Earth System Research Laboratory and the National Institute of Standards and Technology (Boulder Economic Council, 2012). Science and technology businesses are major employers and include Ball Aerospace, IBM, Cisco, Lockheed Martin, and Northrop Grumman (2012). Boulder has a reputation as a hot spot for start-ups and small businesses; for 1989 it received the title of No. 1 city in the country for new R&D start-ups and relocations (Takeuchi, 1991).

Boulder is sometimes described as "25 square miles surrounded by reality" for the liberal, idealistic, and environmentally-concerned reputation of its inhabitants and governance. A *New York Times* magazine article drew attention to the city's tax on electricity made from coal, a bikes-for-homeless-people program, ubiquitous—even sanctimonious—water conservation measures, and the many businesses that boast of their recycling activity as a selling point (Williams, 2008).

Another fairly unique characteristic supports Boulder's insular image, almost literally: The city has exercised growth management for more than half a century. Starting in the post-war building boom of the 1950s, Boulder established a "Blue Line" urban service boundary limiting the extension of municipal water to prevent development in the foothills that would mar their natural beauty (de Raismes, Hoyt, Pollock, Gordon, & Gehr, n.d.). The city, often in cooperation with the county, would later employ several other growth management tools including an addition to the sales tax to purchase a belt of open

Table 2: Boulder Zero Waste Case Timeline

<i>ECO-CYCLE INTRODUCES RECYCLING TO BOULDER</i>	
1976	Eco-Cycle volunteers start collecting recyclables from Boulder residents
1979	Eco-Cycle introduces block-leader program to encourage recycling
1983	Eco-Cycle turns first profit, \$9,000
1984	Eco-Cycle expects to lose \$60,000, lays off 9 of 37 employees due to international market conditions
1986	Boulder's per-capita recycling rate makes it the third-most successful program in country
<i>GOVERNMENT GETS MORE INVOLVED</i>	
1989	City of Boulder institutes trash tax City of Boulder takes over recycling, contracts with Eco-Cycle and Western Disposal
1993	Clinton administration imposes federal purchasing policy requiring recycled content in paper
1994	<i>Carbone</i> Supreme Court ruling finds flow control ordinance unconstitutional
<i>FOCUS ON RECYCLING BUSINESS AND MARKET DEVELOPMENT</i>	
1996	Eco-Cycle is first community recycler to sign 20-year paper marketing contract with Weyerhaeuser Market for recycled PET plastic crashes Eco-Cycle now has 55 employees, processes 35,000 tons recyclables, earns \$3 million in revenue
1997	Boulder County identifies site for new MRF EPA awards Colorado its first of two grants to develop recycling industry; money goes to Eco-Cycle Growth in local government recycling programs leads to national supply gluts
1998	Bidding controversy to build/operate new Boulder MRF erupts
1999	GRRN pressures Coca-Cola to use recycled plastic
<i>NEW RECYCLING POLICY AND FACILITIES</i>	
2000	Boulder County starts building new \$15 million, state-of-the-art MRF
2001	Eric Lombardi publishes articles introducing concept of zero waste City of Boulder creates flow-control work-around to direct material to new MRF Eco-Cycle operates new MRF, opens CHaRM
<i>TOWARDS ZERO WASTE IN BOULDER</i>	
2005	Boulder County adopts zero waste resolution
2006	Boulder city council adopts zero waste resolution and waste reduction master plan EPA presents Eco-Cycle and Boulder farmers' market with award for ZW initiative
2008	Boulder County adopts PAYT, single-stream recycling, compostables collection Global demand for recycled material plunges
2009	Boulder city council purchases \$6 million site for Recycle Row/6400 Arapahoe
2010	Boulder county commission passes zero waste plan
2012	Site development for 6400 Arapahoe begins

space around the city—the first voter-approved tax for this purpose in U.S. history (de Raismes et al., n.d.; City of Boulder, n.d.a). Boulder voters approved all subsequent tax increases (except for one) for the Open Space Program throughout the 1980s and 1990s; as a city government report observed, “the public did not insist on the specifics of proposed acquisitions. The program had gained the public’s trust” (de Raismes et al., n.d., p. 22). Today Boulder’s total preserved and protected open space stands at more than 45,000 acres (City of Boulder, n.d.a).

But Boulder’s growth management policies—combined with high demand due to the area’s unusually sunny weather, proximity to outdoor recreation, and proliferation of jobs for the well-educated—have led to relatively high housing prices, a housing shortage, and, as the city itself acknowledged around 2000, “increasing commute times for working people and attendant environmental impacts on the whole region” (de Raismes et al., n.d., p. 44). Years later, the 2009 median housing price in Boulder stood much higher at \$477,700 than the \$237,800 median for the state of Colorado (City-Data.com, n.d.).

As one City of Boulder study acknowledges, “Boulder has a long history of citizens and city leaders making decisions which have cumulatively contributed to Boulder’s desirability today” (de Raismes et al., n.d., p. 48). One such set of decisions, if judged by the rigor and pride with which residents, businesses, and government pursue them, is the area’s comprehensive materials-management policies unusual for a community located mid- continent.

4.1.2. A challenging state for alternative materials management

The low cost of landfilling

Boulder’s zero waste ethos is best appreciated in the challenging context for recycling in the Rocky Mountains. Tipping fees, which landfills charge waste haulers for depositing loads, vary widely across the country, generally high in the northeastern United States where population density is high and fewer, larger landfills mean less competition, and low in the south, interior, and many western states where the opposite conditions prevail (“Tipping Fees,” 2012). Colorado historically has enjoyed low tipping fees (E. L. interview). This economic condition provides little incentive to pursue materials management beyond landfilling, usually the cheapest option for dealing with discards in the state.

In 2009, Colorado’s Department of Public Health and Environment issued its first annual report to the state legislature on the status of solid waste and materials management within its borders. The report noted that Colorado’s recycling rate of 12.5 percent was low compared with other parts of the country—but also observed that this state falls within a regional norm: “The Rocky Mountain region has the lowest regional recycling rate at 9%, as compared to a national average of 28.5%” (Colorado Department of Public Health and Environment, 2009, p. 16).

State priority: hazardous waste

Colorado’s main solid-waste concern has been hazardous waste. The state’s most infamous example is Rocky Flats, a 6,240-acre federal facility that produced components for nuclear weapons between 1952 and 1992 and is located 10 miles south of the City of Boulder (U.S. EPA, n.d.c). The plant shut down in

the late 1980s due to concerns about severe contamination of the facility itself and surrounding air, soil, groundwater, and surface water with hazardous and radioactive substances (U.S. EPA, n.d.c). The federal Department of Energy assumed responsibility for cleanup of Rocky Flats under the Comprehensive Environmental Response, Compensation, and Liability Act (aka Superfund), with support from the EPA and Colorado Department of Public Health and Environment (DPHE) (U.S. EPA, n.d.c). Clean-up of the area—one of the largest Superfund sites in history—was completed in 2005 but the DPHE remains responsible for continual monitoring and maintenance (Brazzle, 2010; Colorado Department of Public Health and Environment, Division of Hazardous Materials and Waste Management, n.d., 2009).

The Colorado state government generally has not prioritized waste reduction beyond hazardous waste. At this point it does not have a statewide waste-diversion goal, although the state in 2009 established a Subcommittee on Carbon Reduction and Waste Minimization Strategies (under the Commission on Solid and Hazardous Waste) in part to develop one (Colorado Department of Public Health and Environment, n.d.). In the minutes for one of the subcommittee's meetings, the chair described Colorado as "embarrassingly behind" in terms of a statutory framework for [a] statewide diversion goal" (p. 1) and noted how unusual this was among other states (Solid and Hazardous Waste Commission, Subcommittee on Carbon Reduction and Waste Minimization Strategies, 2009). But other members at the meeting predicted that local governments would resent the state "dictating terms to them" (p. 2).

Still, Colorado has shown willingness to promote recycling through a scattering of materials-management initiatives, some of which are described later in this case study. During the 1990s, the state joined the national trend exploring recycling's potential to contribute to jobs growth, offering grants to local projects, partly in collaboration with the EPA. In 2007, the state adopted a surcharge on landfills to help fund the Colorado Recycling Resources Economic Opportunity Act ("Grant Funding," 2008). This money was used, at least in 2008, to try to develop the state's recycling industry.

4.1.3. Boulder's own landfill problems

In the 1980s-1990s, the nation's twin preoccupations at the time with hazardous waste and dwindling landfill space hit close to home in Boulder. The county's Marshall Landfill, which served as the destination for the area's municipal solid waste and other sources of hazardous waste, was shut down in 1991 (U.S. EPA, 2003b). In the early 1980s, the EPA had identified high levels of contaminants including the cancer-causing chemicals benzene and trichloroethylene leaching from the landfill into nearby water sources used for both municipal supply and ranch irrigation (U.S. EPA, n.d.a). EPA added the landfill to its National Priorities List in 1983 and it became a Superfund site eligible for decontamination. By 2005, cleanup of the site had cost the City of Boulder taxpayers nearly \$5 million since the local government was designated as one of the responsible parties, along with Browning-Ferris Industries (now Allied Waste) (Matsch, 2005; U.S. EPA, 2003).

After Marshall Landfill closed, Boulder started using a landfill located in a neighboring county. This is significant to Boulder's zero waste story because it meant that the community no longer had control

over certain disposal-related economic levers—tipping fees or landfill surcharges—that could be manipulated to influence behavior in service of materials-management goals.

4.2. Eco-Cycle pioneers recycling in Boulder

4.2.1. *Hippies and hollowed-out school buses*

Recycling in Boulder began early, in 1975, with social worker Pete Grogan whose main concern at the time was not recycling itself. Says Eric Lombardi, Eco-Cycle's current Executive Director, Grogan was simply looking for a way to raise money to take a group of kids to the zoo. He ran an ad in the local newspaper encouraging Boulder's residents to drop off their newspapers on a particular street corner one Saturday so that he could haul them in his rented semi to a processor for cash. The response was overwhelming. Recalls Lombardi, Grogan and his volunteers realized that they had "something going on here." The following year they founded Eco-Cycle, incorporating as a nonprofit.

Eco-Cycle started with a drop-off site where residents could take their recyclables, but eventually the nonprofit decided to introduce curbside collection service. They divided the town into quarters and would rotate monthly service among them using a distinctively repurposed fleet of collection vehicles—hollowed-out yellow school buses. For labor, Eco-Cycle offered community groups (such as children's scout troops) a fundraising opportunity: \$200 for six hours of work from 15 group members. This system proved useful for communicating the new nonprofit's message, as Eric Lombardi explained:

So these 15 kids would show up and their parents were a little bit nervous, because who are these hippies driving yellow school buses around town and my kid's getting on the bus with them, right? And so we had a lot of parents coming to work on a Saturday with their kids. And that proved to be an incredible thing because the parents got turned on to recycling and then they would tell their friends and the word started spreading about this crazy program in Boulder with yellow school buses and kids, so that was a big deal. The actual way we collected the recyclables ended up being important in disseminating our greenness. (E. L. interview)

As stated on a placard at Boulder's MRF, in 1979, Eco-Cycle opened Colorado's first recycling facility with funding from the state, Boulder County, businesses, and individuals, on land donated by the City of Boulder. Local government expressed further support for Eco-Cycle's mission when, in 1981, the Boulder County Commission passed a resolution requiring a fee or surtax of 20 cents per cubic yard of trash, for disposal at the Marshall Landfill (Skumatz & Breckenridge, 1990; Germani, 1984). The fee generated about \$100,000 a year for the Resource Recovery and Recycling Fund to, e.g., support Eco-Cycle and waste-diversion activities including the introduction of curbside recycling in the City of Boulder (Skumatz & Breckenridge, 1990; Germani, 1984).

4.2.2. *The block leader program*

Three years after Eco-Cycle formed, the nonprofit faced financial challenges that required it to become more resourceful when its request for a \$30,000 grant was refused by the Boulder city council (E. L. interview). By then hundreds of people in the community had become enthusiastic recyclers. As

Lombardi recalled, Bob Alexander, a professor of behavioral sciences at University of Colorado, figured that recycling (and associated revenues) could be increased if committed volunteers were each made responsible for maximizing recycling activity within a single city block. Twice a year their job would be to go door to door to their block's residents, hand out a newsletter, and say, "I'm your local recycling expert and I'm going to tell you how to participate. Here's my phone number if you have any questions."

Eco-Cycle eventually recruited about 800 block leaders, and they took their responsibility for educating fellow residents seriously; neighborhoods with block leaders achieved recycling participation rates as high as 75 percent (Germani, 1984). Pete Grogan emphasized the importance of instilling the recycling ethic in Boulder's residents, citing "voluntary participation" as key to Eco-Cycle's recycling success; "We're trying to sell a behavior change and funding won't buy participation ... volunteers give us something you can't buy" (Germani, 1984). In the mid-1980s, Grogan reported that Boulder's voluntary recycling program was the third-most successful in the United States as measured by per-capita volume—behind only Long Island and Montgomery County, Maryland, two localities where recycling was mandatory (Bronstein, 1986).

Boulder's block leader model became nationally famous and was adopted by other communities including Minneapolis, Minnesota; Austin, Texas; Stephens Point, Wisconsin; and Grand Rapids, Michigan (Germani, 1984).

4.2.3. Growth and profit – and their transience

Within eight years of its inception, Eco-Cycle had, in addition to hundreds of volunteers, 42 full-time employees working seven days a week (Germani, 1984). It also became the country's first recycling effort to turn a profit, \$9,000 in 1983, from \$720,000 worth of material sales to manufacturers both domestic and international (Germani, 1984). A year later, profits nearly quadrupled to \$34,000 (Berger, 1985).

But the following year, in 1985, Eco-Cycle expected to lose \$60,000 and had to lay off nine of its 37 employees (Berger, 1985). The strong U.S. dollar at the time meant that domestic sources of recycled materials could not compete with cheaper foreign sources of virgin materials (Berger, 1985). Gary Liss, then president of the National Recycling Coalition, suggested that local governments across the country might need to subsidize recycling programs to keep them operational (Berger, 1985). Indeed, it took a \$30,000 infusion from Boulder County to maintain Eco-Cycle's level of service (Berger, 1985).

Difficult conditions for recyclers continued into 1986. The National Association of Recycling Industries came out against mandatory recycling because it flooded markets, and states including Oregon, New Jersey, Illinois, Michigan, and Maryland tried to create their own markets to absorb recycled material through procurement policy (Bronstein, 1986). At this point, the prices that firms paid Eco-Cycle for its recyclable materials covered only about 80 percent of the nonprofit's collection and processing costs; Eco-Cycle was losing \$15,000 per month (Bronstein, 1986).

But the yellow school buses continued making their collection rounds well into the 1980s. By 1988, Eco-Cycle was running 33 buses every Saturday in Boulder and the neighboring City of Longmont (E. L. interview). According to Eric Lombardi, the City of Boulder, noticing the trend in municipally-funded recycling programs emerging in other parts of the country, decided it was time to take a more active role in coordinating and professionalizing recycling on its own turf.

4.3. Government gets more involved and forges partnerships

4.3.1. *The trash tax*

In 1989, the City of Boulder adopted the “trash tax”—a tax on residents’ and businesses’ trash bills to help pay for one of the first municipal curbside recycling programs in the country (City of Boulder, Office of Environmental Affairs, 2006; K. M. interview). A ballot measure passed in 1994 increased the trash tax rate and gave the city council the authority to further raise the rate up to a maximum level (City of Boulder, n.d.b). The trash tax—which the city council raised and lowered as needed over the next 15 years—would fund various projects on Boulder’s path to zero waste: curbside compost collection, the transition to single-stream recycling, energy conservation and efficiency, and new materials-management facilities (City of Boulder, n.d.b). Today the trash tax stands at \$3.50 per month for households and \$0.85 per cubic yard of trash for most businesses and multi-family housing (City of Boulder, n.d.b). The tax generates about \$1.8 million per year (City of Boulder, n.d.c).

4.3.2. *A collaboration: Eco-Cycle, Western Disposal, and the city*

Roles of the major actors in Boulder’s materials management community changed with the introduction of the trash tax. As Kara Mertz explained, a three-way contract emerged: the city government paid for the recycling service, Western Disposal—the region’s dominant trash hauling company—started collecting all recyclables curbside, and Eco-Cycle processed the materials at the recycling center. Another nonprofit, the Boulder Energy Conservation Center (today called the Center for ReSource Conservation), had a smaller educational role in the contract.

Eric Lombardi described the new arrangement as a “shotgun marriage” between Eco-Cycle and Western Disposal. This metaphor of strained matrimony is common in accounts of the relationship between the community-based recycler and the materials-hauling company. Said Kara Mertz:

I wouldn’t say that we don’t need marriage counseling every once in a while, but ... I think each of the organizations has been committed to their place in the future of the community and has really understood that it is an overarching community value from not only the government’s perspective but from the residents’ and businesses in Boulder’s perspective.

Western Disposal

The Boulder area’s dominant trash hauler, Western Disposal, is very much a local business; as the company states on its website, it is “locally-owned, locally managed and locally invested” (Western

Disposal Services, n.d.). Western's range covers Boulder County and Broomfield County, to the southeast of Boulder.

Western Disposal does not disclose the number of households it serves but interviewees for this case study acknowledged that Western handles almost all households in the City of Boulder and much of the county, and faces little threat from other competitors. Jeff Callahan, Manager of Boulder County's Resource Conservation Division, explained that the larger existing waste haulers in the region, national giant Waste Management and Colorado-based Alpine Disposal, have made few inroads in the Boulder market. These two firms both concentrate their own hauling operations in the Denver metro area and run their own processing facilities there, so traveling the 30 minutes to Boulder County with its areas of low population density means more time on the road and thus less economic incentive for these larger companies to make the effort (J. C. interview).

According to Bryce Isaacson, Western Disposal's Vice President of Marketing, Western has "been a big part of why the City of Boulder is where it is today," in terms of waste management. He noted that back in the early 1980s, Western was the company that the city contracted with for recycling, "to get out of school buses and get into an efficient way of collection." Western patented the truck that it used at that time—a multi-compartment vehicle to separate material streams with a packing mechanism for cardboard (B. I. interview).

4.3.3. The Boulder County sales tax

The recycling ethic that originated in the city found a willing partner in the county whose cooperation and resources would help develop the region's zero waste identity and national reputation.

In 1994, Boulder County voters approved a tenth-of-a-percent addition to the local sales tax to generate funds for recycling-related projects, including a new materials recovery facility (MRF) and a composting system to serve the county (Acohido, 2000). It was a temporary tax, imposed for seven years and set to expire at the end of 2001. By paying for the new facility completely with earmarked funds before it even opened, officials eliminated a major source of economic pressure plaguing other facilities across the country; a pre-paid MRF had only to concern itself with operating costs, which could easily be covered by sales of its recyclables even when market prices were relatively low. The special sales tax eventually would raise about \$21 million, \$15 million of which went toward construction of the MRF (Acohido, 2000).

Shortly after passage of the sales tax increase, Boulder County and nine cities and towns created the Boulder County Recycling and Composting Authority which would become responsible for, among other tasks, overseeing the siting and construction of the new MRF (Acohido, 2000). The authority established a goal of recycling 50 percent of the county's trash by 2005 (Auge, 2000).

4.3.4. Government promotes recycling-related economic development

First forays

Throughout the 1980s and 1990s, recycling came to be seen as not only a practical response to real or perceived resource shortages and environmental problems, but also as a strategy for economic development, jobs creation, and even social remediation and skills-building for at-risk populations. Many independent projects emerged at the local level, often with nonprofit leadership and state support, and with varying degrees of success and longevity. Some of these projects were profiled in Weinberg, Pellow, and Schnaiberg's account, *Urban Recycling and the Search for Community Development* (2000). The book presents case studies of a variety of initiatives in Chicago and surrounding localities large and small, chosen for their representativeness of projects across the country.

An ambitious effort was initiated in the 1990s in the Chicago suburb of Maywood, Illinois—a community that had lost significant resources: private industry, federal support, and high-income residents (Weinberg et al., 2000). Local planners identified two resources still available to Maywood: an unemployed labor force and garbage. They planned to put them to productive use in remanufacturing by building an integrated materials recovery facility—a MRF whose processed materials would serve as feedstock for on-site industrial plants producing paper products and ethanol, promising 275 permanent jobs for local residents. This venture was bolstered by a state of Illinois policy ordering that at least 25 percent of its purchases of paper products come from recycled sources. But after a six-month, \$30,000 planning effort, the Maywood initiative died because it could not secure funding due to its unconventional nature and lack of its own resources. As Weinberg et al. (2000) explained, large market actors are “primarily interested in recycling programs built on preexisting practices and in the city's willingness to put up much of the risk capital” (p. 116).

Another suburb of Chicago, the City of Evanston, Illinois, viewed recycling as a way “to salvage both at-risk young adults and natural resources” (p. 133) and mandated that its recycling program link with social programs (Weinberg et al., 2000). Thus Evanston's publicly-built and -owned MRF partnered with corporate underwriters and nonprofits to run a recycling facility that also functioned as a job-retraining program. Starting in the early 1990s, the MRF hired mostly at-risk workers including gang members from the area into an eight-month training program that provided employment for four days a week and a life-skills seminar on the remaining day with topics such as math, writing, and personal finance. The program's success was evidenced by a 90 percent placement rate for its trainees (Weinberg et al., 2000).

Evanston's MRF survived the market slump of the early 1990s because it paid employees only five dollars an hour—low compensation for a long-term job but realistic for jobs training, especially when its workers proved likely to move on to higher-paying work as a result of their participation (Weinberg et al., 2000). But the program shut down in less than a decade due to shifts in local political interest and market changes, including Browning-Ferris Industries' action of buying out a local recycling hauler and funneling the recyclables elsewhere, which decreased material flow to the Evanston MRF so that it could no longer run at full capacity (Weinberg et al., 2000).

The February, 1991, issue of *Resource Recycling* observed potential for developing small businesses that use recycled material:

Until recently, the marketing efforts of most recycling programs involved researching the existing industry buyers and negotiating the prices for each grade of the recyclable material, quality requirements and shipping arrangements. This narrow approach to marketing recyclable materials seemed to be a leftover from earlier attitudes about garbage: “Get it collected and get it out of town!” Today, however, the ever-increasing quantity of collected materials calls for creative approaches to market development—including keeping the materials “at home” to develop local markets and increasing their value locally before export.” (p. 48).

The article profiled many small businesses based on recycling that have emerged. Cascade Forest Products in Arcata, California, used sawmill wood waste to create soil products; Leatherback Industries in Hollister, California, converted corrugated containers and mixed waste into asphalt roofing material; Packaging Company of California based in Red Bluff manufactured 200 types of molded pulp products (egg cartons, plates, etc.) using pre- and post-consumer waste paper; and Rubber Products, Inc. of Tampa, Florida, found that it could meet the niche sports-facility need for “high-abuse flooring” with material made from scrap rubber (Gainer, 1991).

Federal interest and action

The federal government took notice of the growing number of recycling-related jobs experiments across the country and soon contributed its own resources. Its widest-reaching effort began in 1994 when the Environmental Protection Agency established a \$2.7 million grant-based program, Jobs Through Recycling, or JTR (“EPA Grant Program,” 1994). The program had four components. First, it would create Recycling Business Assistance Centers (RBACs) in selected states and tribes. RBACs were tasked with increasing capacity in recycling industries and stimulating economic development by providing technical, business, financing, and marketing assistance. Second, JTR provided separate funding to create Recycling Economic Development Advocate (REDA) positions within some state government departments of commerce or economic development. REDAs were responsible for attracting and expanding businesses that use recovered materials. Third, the program would create a national network to help inform businesses about recycling technologies and identify barriers to their use and goals for research. Fourth, JTR promised federal interagency cooperation to support recycling-related business.

Colorado’s experiment—and lessons learned

Twelve states received funding during the initial round of grants for the first two components of the JTR program (Polk, 1995). In later rounds, Colorado received two JTR grants totaling nearly \$400,000, both of which the state funneled to Eco-Cycle for development of about 20 recycling-related businesses (Hartman, 1999).

The initial grant of \$236,000 helped to establish a business incubator to provide assistance for start-ups and existing companies that recycle paper and containers (“EPA Awards,” 1997). Examples of Colorado companies with specific research or development needs funded by the incubator include: Boulder-based Resource 2000 which dealt with reuse and recycling of materials recovered from construction and

demolition; Providers Resource Clearing house of Denver, a nonprofit company that sold used household and office furniture and equipment to other nonprofits and planned to expand operations to renovate furniture and upgrade computers; GoldCan Recycling of Boulder, which produced a reverse vending machine where people could drop off aluminum cans for cash; and Boulder-based Eco-Products, which distributed recycled and energy-efficient products (“Four Companies,” 1998).

The main intent of the funding was to help create local markets for the increasing amounts of materials recovered through local recycling programs. *The Denver Post* explained Colorado’s challenge for the incubator:

Ushering in a new business or a new way of doing business is tough enough, but it's especially challenging if your product is recycled. For example, plentiful, cheap land in Colorado and dryer [sic] conditions here keep landfill costs and dumping charges low, thereby dampening the value for some recyclables. These conditions are made worse from a shortage or non-existence of local processors in some markets that can round up valuable refuse for reuse. As a result, each day tons of recyclables, including all types of plastics, green and clear glass, construction debris such as scrap boards, discarded personal computers, small appliances and textiles are shipped out of state for a loss or simply condemned to dumps. To avoid this, the incubator wants Colorado manufacturers to increase their demand for recycled raw material and develop more processors to serve these manufacturers. (“EPA Awards,” 1997)

Greater local demand for recovered materials would also reduce costs to local recyclers like Eco-Cycle, as Eric Lombardi explained: “We’d like to have some Colorado markets so we don’t have to spend this money shipping stuff 1,000 miles away” (Hartman, 1999).

The state and other nonprofits were also spending their own funds on recycling-related economic development. The Colorado Housing and Finance Administration provided \$4.9 million in low-interest loans to existing businesses that recycled tires, wood, metals, and other materials—a program funded with disposal fees for used tires (Hartman, 1999). The nonprofit Colorado Recycles explored new uses for recycled goods in building materials and ways to communicate these alternatives (Hartman, 1999).

The last media account of Colorado’s recycling business incubator reported that it was in the process of spending the grant money on consultants to assist with start-ups (Hartman, 1999). After that, the trail all but ends. In the early 2000s, the University of Colorado Business Advancement Center and the Colorado Environmental Business Alliance jointly assumed responsibility for services formerly provided by the incubator and reported that the effort had generated 53 jobs, 5,832 additional tons of capacity for recovered materials, and the use of 2,883 tons of that material (University of Colorado Business Advancement Center, n.d.). But this apparent new partnership last updated its website more than a decade ago, in 2001.

Little information exists on the outcomes of the EPA’s Jobs Through Recycling program in general; even the agency’s website has virtually no description of the program itself, let alone a publicly-available evaluation.

Eric Lombardi's assessment of Eco-Cycle's JTR experience, however, provides some frank insight: "I consider it my greatest failure," he said in his interview. Lombardi noted that every project in the entire JTR program failed, too—except for the one in North Carolina. According to his explanation, people associated with the project in that state understood that four years was not enough time to fully develop the necessary support system, so they made sure to keep funding the effort within the state government after the grants expired. "Basically the federal money ran out, so [the other] communities stopped the project, one community [program] stayed alive, and it was because the state of North Carolina kept it alive" (E. L. interview).

Indeed, North Carolina's RBAC office is still active and its website shows a significant amount of current activity (NCDENR, n.d.a). According to the office's 2010 report on employment trends in the recycling industry, the state's trend in recycling employment has experienced unbroken growth, from 7,757 in 1994 to 15,200 in 2010 (NCDENR, n.d.b.).

But continuity in state support was not the only prerequisite for success of recycling-based business, observed Lombardi:

The lesson we learned—and this was really important because it helped me form my opinions, strong opinions, around social enterprise and private-sector partnership with public—the overall lesson is that business was further ahead than we were, as do-gooders. Business had already investigated the opportunities to recycle more and use more recycled [material] in their products. (E. L. interview)

Lombardi explained that business already understood that they could not manufacture products using recycled content unless three criteria were met: quantity, quality, and reliability, or QQR. They need access to large amounts of a recycled feedstock that must be of high quality and available on a reliable basis.

Lombardi contends that the only way to satisfy the QQR criteria would be "if the community and the government took control of the discard stream." He pointed out that in the private sector, a private company has control over the resource, such as a gold or silver mine:

And when they sell x number of pounds of silver to a company, they can deliver quantity, quality on a reliable basis because they own the mine. Well, nobody owns the urban mine [of recyclable material]. And so that's when I really became convinced, we have to have public ownership of these resources. Then business will play with us. Because they were very clear; they said, "look, sign on the dotted line here. You get me this many tons for this quality for five years, and I'll play." Well, none of us [community based recyclers] could sign that contract. (E. L. interview)

The infrastructure and policy for ensuring a useful stream of recyclable material matters for business. But it seemed difficult for recyclers and communities to develop those prerequisites when market prices fluctuate so rapidly and dramatically.

4.4. Chaos in government policy and market prices

4.4.1. Volatile scrap material prices

Volatility in recyclable material prices posed a challenge for Boulder’s recycling effort, as for many other communities across the country. Some relief came in 1996, when Eco-Cycle signed a 20-year paper marketing contract with corporate paper-producing giant Weyerhaeuser (“MRF Signs,” 1996). The contract provided the nonprofit with greater price stability through a guaranteed floor. Weyerhaeuser began offering these long-term contracts two years earlier but Eco-Cycle was the first community-based recycler in the country to sign one (“MRF Signs,” 1996).

But Eco-Cycle processed other materials and remained vulnerable to market swings for those commodities. The same year as the nonprofit signed its new paper contract, in 1996, the market for recycled PET plastic crashed. The Food and Drug Administration (FDA) had recently approved 25% post-consumer (recycled) resin content for plastic food containers, which helped the market for recycled PET—polyethylene terephthalate, the most commonly used and recycled plastic (Glenn, 1996). The plastics industry saw great potential growth for PET use and built two major new manufacturing plants for the material; however, the plants produced plastic using virgin materials instead of recycled PET. Manufacturers prefer to use virgin plastic because it is of more predictable and consistent quality. Thus the new supply of cheap virgin PET flooded the market, forcing the price of recycled PET from 20-40 cents per pound in 1995 down to two to four cents per pound the following year (Glenn, 1996).

A few years later, King Soopers, a major chain of grocery stores in Colorado that accounted for more than 25 percent of the state’s recyclables collection, stopped offering drop-off bins for its customers because markets for recycled material had dried up (Jargon, 1999). According to Eric Lombardi, who was interviewed for an article on the topic, Colorado’s relatively low tipping fees were to blame, at only \$15 per ton, compared with \$120/ton in Los Angeles or \$90/ton in Florida. He argued, “If you had that price here for landfills, King Soopers wouldn’t have to do what they’re doing, and there would be so much recycling that your head would spin. King Soopers isn’t a villain here” (Jargon, 1999).

In 1996, *The New York Times* Sunday magazine published John Tierney’s infamous feature that ricocheted around the recycling world, “Recycling is Garbage.” Tierney (1996) called recycling “the most wasteful activity in modern America: a waste of time and money, a waste of human and natural resources.”

As *The Economist* reported, the influx of state and local government laws mandating recycling and the resulting spread of collection programs across the country (at that point serving more than half of the population) had led to a supply glut of recyclable materials (“A Funny Sort,” 1997). Fallout included the country’s largest garbage corporations, Waste Management and Browning Ferris, deciding to sell or shut down many of their own material recovery facilities. As the article noted, 24 of 36 national plastics recyclers closed in response to market conditions—“nevertheless, local governments continued to collect plastics” (“A Funny Sort,” 1997).

4.4.2. *Minimum content standards*

An influential federal paper purchasing policy

Eric Lombardi testified to the power of regulation to change market dynamics by telling the story of “a little decision President Clinton made that no one knows but us recycling geeks, and it changed everything”:

Nineteen-ninety-two ... was the peak of the recycling fervor in the U.S., and I was on the National Recycling Coalition’s board at the time. And it was probably the most progressive, radical board the NRC had as well, one of the most. So anyway, we now have credibility. So the White House—we are now talking to the White House—the White House wants to know what are they supposed to be doing. I guess that was about ’93; they were wondering what they should do to help recycling. So basically they were going to pass a law ... that federal money can only be used to buy paper that has 20 percent recycled content in it. So that’s an EPP [environmental purchasing policy]. But we got to them and said, look: 20 percent’s not good enough. Make it 30 percent. And it turned out that the difference between 20 percent was everything. The reason ... is because you could take a paper mill, a traditional paper mill, and you could retrofit it to make paper up to 20 percent recycled. But as soon as you specified 30 percent recycled, you had to build a new paper mill specifically to use recycled paper. So we had a dogfight in Washington. The existing paper industry was freaking out and all of us environmentalists were pushing hard, and Clinton made the right decision. He said, ok, we’re going to buy 20 percent [recycled content] paper for two years and then switch to 30 percent. (E. L. interview)

This federal purchasing policy resulted in the industry building whole new plants, at a cost of \$300 million each, said Eric Lombardi. It took at least all of 1994 to build the new plants. When they opened in 1995, the new mills—which, as is the industry norm, would run 24/7—sought to buy as much scrap paper as they could to ensure enough inventory for continuous operation. Lombardi recalled:

And so we saw the craziest market ever. I mean, all of a sudden, recyclers were getting rich overnight. We saw markets for one year that were just stunning. And then they fell back down—but they never went back ... to the old, pre-’95 prices.

But the National Recycling Coalition (NRC) whose progressive board helped win the federal paper purchasing policy in the early 1990s grew more ideologically conflicted by mid-decade. Eric Lombardi observed that NRC’s board, which started out with mostly “hippies,” by 1995 had added several major industry players including the National Steel Organization, Coca-Cola, Waste Management, and Weyerhaeuser. These companies made it clear that they did not want national legislation of any kind, and now formed a strong voting bloc on NRC’s board.

According to Lombardi, the big paper companies make most of their money on virgin paper; recycling is just something that they do on the side. So even if they publicly extol recycling, their real interest is in the more profitable production of virgin paper and they will generally oppose policies that require them

to use more recycled scrap. Thus when NRC's board considered a proposal for pursuing a national minimum content standard for newspapers, industry representation ensured that what would have been an easy vote a few years prior now split 50/50, and without the required two-thirds majority, the proposal died.

At that point, members supporting national minimum content standards decided to leave the NRC and start their own organization to advocate for such policies (E. L. interview). In 1996 they established the GrassRoots Recycling Network (GRRN), a group whose funders would include the Turner Foundation (established by media mogul Ted Turner) and chapters of Greenpeace and the Sierra Club (Harte, 1999).

A new zero waste nonprofit takes on a big corporation

Eric Lombardi was GRRN's first spokesman. He recalled that GRRN's first action took place on the steps of Coca-Cola headquarters in Atlanta, Georgia, with bullhorns and TV cameras. The group was trying to hold Coke accountable for an apparent promise the corporation made in 1990 but had yet to implement: to use recycled content in its beverage bottles sold in the United States.

This public battle between the soft drink corporation and the nonprofit continued for years. In February of 2000, Coke issued a press release to correct "misinformation" about the company, maintaining that it did use recycled PET—although it did not specify how much—in its bottles for the U.S. market and expected to increase that use over time (The Coca-Cola Company, 2000). Two months later, the company announced plans to use 10 percent recycled plastic in its bottles that year, and blamed a scarcity of recycled plastic for constraining its efforts (Pitt, 2000). Coca-Cola's director of corporate environmental affairs warned that Coke's new commitment would tighten supplies of recycled plastic and force other companies to produce and use more virgin plastic (Pitt, 2000).

GRRN called Coke's pledge "genuine progress" (Pitt, 2000). However, the group also attributed the company's dragging pace of voluntary change to an absence of stringent government regulation on its home turf:

Coke notes proudly that they use plastic bottles with recycled content, as well as environmentally preferable refillable bottles, in other countries, due to strict governmental mandates on recycling. Coke has spent millions of its \$1.6 billion annual global advertising budget fighting such mandates (minimum content legislation and bottle bills), especially in the U.S. We have seen how far voluntary promises to recycle plastic got us. Perhaps what Coke is really saying is that they need a little push from mandates to make good on their voluntary commitments? (GRRN, 1999)

It was a very real shortage of recycled PET that resulted in Coca-Cola and another major user of the material, the carpet industry, battling over supply. As reported in *The Atlanta Journal and Constitution*, two Georgia-based carpet manufacturers relying on recycled plastic bottles for raw material asserted that low recycling rates were preventing them from expanding their operations (Bond, 2000). The article quoted one of the carpet executives: "The real irony is, the state of Georgia is the largest [plastic bottle]

processor in the country ... but 75 percent or more of the bottles consumed in this state are going to the landfill” (Bond, 2000).

For Eric Lombardi, the shortage that followed Coca-Cola’s increased use of recycled plastic illustrates the influence of minimum content standards, even voluntary ones like Coke’s: “That’s just with 10 percent recycled content. That’s how meaningful and powerful minimum content standards are, and that’s why they’re controversial.”

The recycled PET shortage led the carpet industry to help organize a new multi-stakeholder group, Businesses and Environmentalists Allied for Recycling (BEAR), funded by the Turner Foundation, to find solutions—although the group was reluctant to consider bottle deposit laws long opposed by beverage companies (Bond, 2000). In 2002, BEAR released a report produced by a team of consultants finding that indeed “deposit systems result in the highest level of recovery” (R. W. Beck, Inc., p. ES-3); together the 10 states with container deposit laws reached a recovery rate of 71.6 percent, compared with a 27.9 percent rate for non-deposit states. The report predicted that “beverage container recycling rates would decline in the absence of new recovery and market development initiatives” (p. ES-1).

BEAR’s report stirred controversy. The National Soft Drink Association (NSDA) (2002) issued a press release appearing to reject the entire report on the basis of BEAR’s interpretation of one state’s container deposit program costs. NSDA noted in the release that “the Coca-Cola Company withdrew as a Multi-Stakeholder Recovery Project participant because of their disagreement” over this cost. The press release ended with this statement: “The soft drink industry remains committed to comprehensive curbside and drop-off recycling as the most consumer-friendly and cost-effective methods of capturing used beverage containers and other types of recyclable material” (NSDA, 2002).

4.4.3. *Welfare for Waste*

As it engaged in the public shaming of Coca-Cola, GRRN—along with Friends of the Earth, Taxpayers for Common Sense, and Materials Efficiency Project—released a report, *Welfare for Waste*, arguing that government subsidies advantage virgin material producers and conventional waste disposal over recycling activity:

Subsidies for resource extraction have their twin in subsidies for waste disposal facilities. Both are integral parts of a linear production model which involves extracting raw materials, making them into products, then discarding them ‘out of sight, out of mind’ in landfills and incinerators. The waste disposal industry, in fact, competes directly with reuse and recycling businesses for the supply of discarded resources. Moreover, burying, burning, or otherwise destroying discarded material simply fuels more resource extraction to make more products. (GRRN et al., 1999, p. v)

The report argued that those particular subsidies are no longer needed because they effectively achieved their goal of spurring “the transition of the nation from an agrarian to an industrialized society” (p. v)—yet they persist because of the continuing political influence of the industries that benefited from them.

Welfare for Waste identified 15 subsidies that funnel an average of \$2.6 billion per year into the virgin material and waste management industries: capital gains status for timber sales, below-cost forest service sales, forest roads construction, forest service salvage fund, 1872 Mining Law, mining percentage depletion allowance, expensing exploration and development costs, inadequate bond requirements, percentage depletion allowance, intangible drilling costs, passive loss tax shelter, alternative fuel production credit, enhanced oil recovery, electric power subsidies for aluminum, and private activity bonds.

Of course, community-based recycling itself is subsidized—a point that *Welfare for Waste* seemed to ignore: “resource-efficient recycling and reuse businesses, which tend to be smaller, community-based and run by entrepreneurs, struggle against subsidized competitors” (p. v). This is too broad a statement to gloss over, because as this case study recounts, government—from local to state to federal—funneled dollars into community-based recycling ventures, from Boulder’s own recycling programs and facilities to the recycling-with-a-social-mission ventures outlined in Weinberg et al. (2000).

4.5. New recycling policy and facilities

4.5.1. Boulder County recycling rate lags

For all Eco-Cycle’s past efforts that made Boulder a leader in waste reduction, by 2000 other parts of the country caught up and more, and the residential recycling rate in Boulder County stood relatively low compared with some other localities—even within the same region. An Associated Press article in April of 2000 reported that Boulder County residents recycled 35-40 percent of their trash; nearby Loveland residents recycled 56 percent; the rate in Eugene, Oregon, was 45 percent; and the rate in Chatham, New Jersey, was 65 percent (“Boulder Lagging,” 2000). Boulder’s mayor at the time, Will Toor, commented, “it’s kind of sad when we’re way behind New Jersey” (“Boulder Lagging,” 2000).

Some of the reasons behind these differences were clear and others were not. Certainly, the significantly higher tipping fees in New Jersey—\$140 vs. \$5 per ton in Colorado—made the economics of recycling much more favorable for the east coast state (“Boulder Lagging,” 2000). And Loveland had adopted a unit-based pricing system for trash in the early 1990s that gave residents an incentive to reduce their discards.

But what accounted for Loveland’s early adoption of pay-as-you-throw pricing? In an article in the local paper, Lombardi attributed Boulder’s recycling-rate inferiority to a lack of city or county ownership of waste management: “the single reason for success is public control of the waste stream” (“Boulder Lagging,” 2000). But Loveland’s solid waste official, Bruce Philbrick, disagreed that public ownership was a *sine qua non*: “You just need strict rules. It is important for the public sector to have some control over waste collection, but for it to work in the private sector, you would need strict rules.” The article noted that at the time in Boulder, “there are no laws or ordinances requiring local waste haulers to offer recycling service or unit-based pricing.” This situation soon would change, albeit with prompting from what the city perceived to be a fiscal necessity.

4.5.2. The City of Boulder privatizes and regulates recycling

Around 2000, the costs of Boulder’s curbside recycling program outpaced revenue from the trash tax due in large part to rising fuel prices (K. M. interview). The city council saw the situation as fiscally unsustainable; it would not be able to continue sponsoring its curbside recycling program without increasing the trash tax (Bruno, Grainger, Mertz, & Koehn, 2008). The city decided to get out of the business of providing recycling service itself but wanted to make sure Boulder’s residents still had access to service in some form. To that end, the council held a study session in April of 2000 to consider “a continuum of options” (p. 2) between the extremes of complete municipal control of trash/recycling and total reliance on the free market (Bruno et al., 2008).

Boulder’s trash collection already was a privately-run, subscription-based service in which residents contracted directly with their choice of hauler. The city ultimately decided to privatize recycling collection, too—but, importantly, it also chose to regulate the private providers. The council adopted an ordinance in 2000 requiring all trash haulers with a business license in Boulder to provide unlimited recycling service to their residential customers (Bruno et al., 2008). The ordinance specified the types of materials that should be collected and required their collection in unlimited quantities. The ordinance also required collection to be part of the base trash rate, not a subscription-based service that households could opt out of (K. M. interview).

Another important change was the city’s introduction of volume-based trash rates, commonly known as “pay-as-you-throw (PAYT)” (Bruno et al., 2008). PAYT pricing treats waste collection as a utility like water or electricity: instead of a flat fee, residents pay according to the amount of service they use, usually with bins of different volumes (Skumatz, 2006). Boulder residents would not be able to receive a volume discount for increasing amounts of trash.

Said Kara Mertz, “That was kind of like when the landscape changed in Boulder with respect to zero waste. We weren’t actually calling it zero waste yet; it was still curbside recycling.”

Boulder’s change in recycling policy and facilities also meant a shift in the responsibilities and relationships of the three major entities responsible for materials management in the region. Under this new policy, Western Disposal was getting paid directly by households and they owned the collected material and could sell it (E. L. interview). Eco-Cycle owned the material before then. Said Lombardi, “that almost put us out of business.” But there was still an important role for Eco-Cycle to play as manager of the Boulder County Recycling Center. The nonprofit also would continue to shape Boulder’s next major steps in materials management.

4.5.3. A new materials recovery facility

In 1994, Boulder County voters approved a temporary addition to the sales tax to raise funds for recycling-related projects including a new materials recovery facility. A new MRF would add much-needed capacity and modernization to Eco-Cycle’s recycling operations which, by that point, comprised two outdoor drop-off sites with a maximum processing capacity of 40,000 tons of material a year (Acohido, 2000).

In the late 1990s the Boulder County Recycling and Composting Authority identified a 20-acre site for the new MRF and purchased it for \$900,000 (Acohidio, 2000). But the bidding process for design, construction, and operation of the facility was contentious and protracted, further straining the often uneasy relationship between Eco-Cycle and Western Disposal.

Bidding controversy

In February of 1998, the final round of competition saw three entities submitting bids to build and operate the new MRF: Eco-Cycle, Western Disposal, and a firm based in Charlotte, North Carolina (“Metro Digest, 1998a). The Boulder County Recycling and Composting Authority planned to select a contractor by April but that decision was delayed multiple times into the summer.

In June, the authority was set to award the contract to Western Disposal for its \$12 million proposal (Gewirtz, 1998). The selection committee stated that Eco-Cycle’s bid—which came in at \$7 million—failed to conform to project guidelines, by, among other concerns, proposing construction in a buffer zone adjacent to a wetland area (Gewirtz, 1998).

Eco-Cycle protested and requested to clarify its bid, pointing out that the construction in question was actually a biofiltration system designed to absorb flooding and contaminants to protect the nearby wetland (Gewirtz, 1998). The nonprofit had plenty of community support in its appeal; as reported in *The Denver Post*, “hundreds of Eco-Cycle’s supporters mobbed the board, crying foul and claiming that [selecting Western over Eco-Cycle] would strangle the beloved community organization” (“Metro Digest,” 1998b). Further complicating the authority’s decision was its finding during the re-evaluation that Western had underestimated its MRF operating costs by \$800,000 (“Metro Digest,” 1998b).

In July of that year, the county authority attempted a solution by separating the three components of the contracting work: The authority would hire a design firm itself, bid out construction, and give Eco-Cycle the contract to operate the MRF (“Metro Digest,” 1998b).

As Kara Mertz observed, that was “kind of one of our points in our ‘marital’ history where there were some difficulties.” She says that there was some initial concern that Western Disposal—which remained the dominant hauler in the city after the contract decisions were made—might not want to take its customers’ materials to the new MRF, opting to transport it to Waste Management’s recycling center in Denver. To guard against this possibility, the City of Boulder added some careful wording to a new ordinance.

Flow control

In October of 2000, an article in the trade publication *Waste News* reported:

Beginning Nov. 1, 2001, [City of Boulder] residents will have control over their recycling materials until their contracted hauler picks them up at the curb. That is one part of a newly adopted ordinance created to improve recycling efforts and make sure those recyclables end up in the government-operated center. (Gynn, 2000)

The referenced ordinance is the one for trash haulers that the city adopted in 2000 (Bruno et al., 2008). This raises some questions: do residents really care to decide what processing center their recyclables go to, and, if it is so important that these recyclables end up at the Boulder County MRF, are there not more direct ways to ensure this happens, e.g., by simply requiring haulers to do so?

The concern hovering in the background but that the article never actually mentions is flow control—an issue that has come to complicate community waste management programs across the country. In the late 20th century, many local governments—authorized by statute in 26 states—adopted ordinances specifying where garbage within their jurisdictions was allowed to go for processing or disposal (Luton, 1996). These so-called “flow-control” ordinances were implemented for mainly economic reasons. In one scenario a local government has built a waste facility (such as an incinerator or landfill) itself and needs to maintain a minimum flow of trash to earn adequate revenue from the facility. In another, the local government has signed a “put or pay” (p. 133) contract with a privately-owned facility that similarly requires a base trash flow to earn revenue (Luton, 1996). Under such a contract, the local government must pay the company the equivalent of any revenue shortfall that results if the trash flow to the facility fails to reach the contractual minimum (Luton, 1996). Local governments found flow control ordinances an effective way to avoid additional costs associated with waste management.

The companies that haul waste, however, generally oppose flow control ordinances because they can restrict choice of what is, from a business’s perspective, the most economically favorable destination for the material they haul. For this reason, in the 1990s—after a period of growth in alternative waste management facilities—flow control ordinances increasingly came under attack in the courts (Luton, 1996). The issue rose to the U.S. Supreme Court which, in 1994, ruled in its *Carbone* decision that the flow control ordinance adopted by the town of Clarkston, New York, violated the Commerce Clause. This ruling had sweeping implications for communities across the country, as it “made it clear that states and municipalities cannot, under their own authority, regulate the flow of solid waste into or out of their jurisdictions” (Luton, 1996, p. 13). Luton noted that the legislative branch tentatively ventured changing this state of affairs with a 1995 vote on a Senate bill allowing MSW to cross state lines, but Congress as a whole has yet to pass such a law.

Carbone’s restriction on local government’s flow control accounts for Boulder’s oddly-worded recycling policy. The actual language of the ordinance reads:

(c) In the absence of an express written designation to the contrary initiated by the customer, it shall be presumed that each residential customer or multifamily customer has designated recyclable materials to be hauled to the recyclables processing center owned by Boulder County or its successor in interest. However, each customer may designate another recyclables processing center by notifying the hauler of that designation in writing. This written notification must be given at the initiative of the customer, not the hauler, and may not be written on a form furnished by the hauler. (“Ordinance No. 7585,” 2008)

Here is the logic behind this flow-control work-around: As Kara Mertz explained, the vote in Boulder was highly supportive of raising the sales tax to build the new recycling center—and from this support it is

reasonable to conclude that Boulder residents want their recyclables taken to that particular facility. If any residents prefer use of a different MRF, they could follow the procedure to have that desire fulfilled. Importantly, it is the residents' free will that drives the provision in the trash hauler's ordinance—not a local government mandate. Certainly if enough residents requested that their recyclables go to another facility then the Boulder County MRF might experience an inadequate flow of material, rendering this strategy ineffective. But, as Kara Mertz noted, "as you can imagine, no one's ever done that; no one's ever requested that their materials be taken elsewhere." Thus the language in the ordinance and an amenable population allow Boulder to enjoy the benefits of flow control without the use of a government-imposed (and unconstitutional) form of it.

Kara Mertz said that Boulder is the only community she knows of with this particular flow-control work-around. As Mertz noted, it was the idea of a creative city attorney who "was willing to go out on a limb and put this language in our ordinance knowing that we could get sued for it." But after 12 years they have yet to face legal action. She suggested that other communities seeking a similar kind of de facto flow control would need to consider their ability and willingness to expose themselves to legal challenge.

The new Boulder County Recycling Center

The Boulder County Recycling and Composting authority started construction of the new MRF in 2000 (Acohido, 2000). Boulder firm Edge Architecture designed the facility and firms from Iowa and New York built it and installed the processing machinery, respectively (Acohido, 2000).

The 63,000 square-foot MRF opened in July of 2001 (Acohido, 2000). According to Jeff Callahan, Boulder County's Resource Conservation Division Manager with responsibility for overseeing the MRF's operations, the Boulder MRF is a small to medium-sized facility, typically processing 300 tons of material per day (J. C. interview). In contrast, he noted, larger facilities in major metropolitan areas can process 3,000-4,000 tons per day. The Boulder facility's annual capacity is 75,000 tons (Mata, 2005).

As the author of this thesis found on a site visit in July of 2011, Boulder's MRF is designed as much to educate as it is to process recyclables. Starting in the lobby and continuing throughout the facility, videos and placards present reasons to recycle, describe the sorting processes, diagram the machinery's inner workings, explain where the MRF's recovered materials go, and urge visitors to "close the loop" by "buy[ing] recycled."

An elevated walkway connects the main building to the administrative offices. From this vantage point, a transparent wall allows viewers to observe the activity on the processing floor below. Among the hulks of sorting machinery the only obvious human presence is a row of several workers in blue hard hats standing at a conveyor belt. Plastics are still sorted manually at this MRF; each worker extracts a certain type of plastic and tosses it in a designated bin.

A rail spur adjacent to the MRF's back lot provides the main form of transportation for the baled recyclables that leave the facility for markets across the country. A sign in the recycling center explained

the benefits of trains over trucks: one railcar carries the same load as three semi-trailers, resulting in savings of more than 115,000 gallons of diesel fuel and five million pounds of carbon dioxide per year.

Many of the materials used in the MRF building itself are recycled products. Placards on the walls explain that the carpeting is made from PET plastic bottles, entry mat tiles are recycled PVC and interlock so they require no adhesive for installation, and some of the paint is remanufactured latex. The building also incorporates energy-saving features: tubular skylights use reflective aluminum and prisms to channel sunlight into windowless areas; clerestory windows allow indirect daylight to replace most lighting in the lobby and on the processing floor, saving \$4,000-\$5,000 a year; and strategically-placed roof overhangs keep offices cool in summer.

A large-capacity presentation room in the main building allows for group education on site. Plaques on the walls with text and pictures chronicle recycling in Boulder, starting with Eco-Cycle's hollowed-out school buses and continuing through its zero waste commitment. Thus this MRF also serves as a kind of monument to Boulder's place in community-based recycling history.

According to Jeff Callahan, Boulder County's Resource Conservation Division Manager with responsibility for overseeing the MRF's operations, today Boulder County's recycling program functions as an enterprise, meaning that the recycling center and its programs do not derive any revenues from the county's general fund; "all of our revenues and all our expenses are paid for by the sale of recycled materials out of this facility" (J. C. interview). Expenses include two-and-a-half staff, the operating cost, payments to the haulers who take their collected material to the MRF, and associated programs such as recycling education (J. C. interview).

There are two other single-stream processing centers in the area, both located in Denver about 30 minutes from Boulder. One is run by national corporation Waste Management and the other by Colorado company Alpine Disposal; they both accept materials collected by other haulers (J. C. interview). But the City of Boulder's quasi flow-control ensures that these other facilities pose little real competition to the Boulder County Recycling Center.

4.5.4. Other material concerns and facilities

The Boulder MRF handles the most commonly-recycled materials—paper and containers. But as Eric Lombardi explained, a community typically has five discard streams: traditional recycling, composting, hard-to-recycle or non-traditional goods, items salvaged for reuse, and construction and demolition debris (C&D). Eco-Cycle has long concerned itself with how to deal with a variety of materials beyond the basics.

Electronics recycling

In 2000, Eco-Cycle started Colorado's first home-computer collection and recycling program with a \$115,000 pilot project funded by the nonprofit and money from the EPA and the state's Office of Energy Management and Conservation (Whaley, 2000). At the time, computers were particularly toxic discards, containing five to eight pounds of lead and a variety of other heavy metals and chemicals including mercury and arsenic (Whaley, 2000). But Eco-Cycle maintained that 90 percent of a computer can be

recycled. The nonprofit aimed to collect 80,000 pounds of computers and related equipment during three events held throughout the year and use the experience “to learn how to make home-computer recycling work” (Whaley, 2000)

One outcome from the pilot is implied by the fact that Eco-Cycle now charges a fee to take discarded computers and other electronics. As Eric Lombardi (2007) warned in a letter to the *Daily Camera*, free computer recycling events advertised by other outlets are appealing but misleading; old electronics are often sent overseas where they are broken down and much of their material discarded in ways that threaten human health and the environment. Indeed, a *60 Minutes* segment that aired in November of 2008 exposed Executive Recycling, which had sponsored free e-waste recycling in Boulder, to be guilty of such activity (Matsch, 2008). In contrast, electronics that are retained and recycled in the United States are subject to this country’s stricter environmental regulations—a naturally more expensive process.

Eco-Cycle would eventually become the only electronics recycler in the Boulder area certified by the Basel Action Network, an organization named for the international convention adopted in 1992 in Basel, Switzerland, which seeks to limit the export of hazardous wastes, particularly from wealthy countries to less wealthy ones (Basel Action Network, n.d.; Lombardi, 2007). The United States as a whole currently is not party to the convention.

CHaRM

Eco-Cycle expanded its recycling of unusual discards beyond electronics when it opened the Center for Hard to Recycle Materials (CHaRM) in November of 2001. CHaRM’s mission is to collect a variety of unconventional items from the Boulder area and link them with markets that could put their materials to productive use (Aguilar, 2011). Each year the center—the first of its kind in the United States—aims to add at least one new item to its expanding list of goods that it will accept for recycling (Wolff, 2009).

At its original Old Pearl Street location, CHaRM’s yard serves as a sort of purgatory for a variety of household and commercial items that are no longer functional in their current form. There are designated bins for expired fire extinguishers, porcelain bathroom fixtures, athletic shoes, textiles, yoga mats, cooking oil, and bicycle parts, among other discards. A building at the rear of CHaRM’s property houses a machine known as the Styrofoam densifier which compresses large foam blocks (such as those used in packaging for electronics) into a smaller form that can be more easily shipped to a remanufacturer for eventual use in new goods including CD cases and light switches (Aguilar, 2011). Grant money for purchase of the densifier came from the Colorado program to help develop the state’s recycling industry, with funding from new landfill surcharges that went into effect in 2007 (“Grant Funding,” 2008).

Eric Lombardi described his staff members as working like “investigative journalists” to ensure that the companies they work with will responsibly handle the materials they get from CHaRM, instead of, for example, sending them to another country with lax environmental standards, as can be a problem particularly with electronics (Aguilar, 2011). Most of CHaRM’s materials end up as inputs for small, local producers: yoga mats go to a company that turns them into messenger and tote bags, Green Guru Gear

turns bike tire inner tubes into goods like wallets and cell phone cases, and an organization called Community Cycles takes a variety of bike parts for use in bike-repair training programs (Aguilar, 2011; Collins, 2009b).

In her oral history of Eco-Cycle, former Eco-Cycle board member Mary Wolff explained the challenges that CHaRM faces when it selects a new material to recycle:

It takes quite a while to do, because each product, the staff has to do research on what the market is, and they have to find a market before they can start collecting it. Sometimes it's a market that they can sell to. Sometimes it's a market that people will just take the stuff and do something with it, but they won't pay anything for it. It needs the subsidy that the city provides, or it wouldn't be able to continue to operate. (Wolff, 2009)

Ten years after its inception, CHaRM had yet to break even (Aguilar, 2011). Eco-Cycle's Eric Lombardi noted that Colorado's low tipping fees make landfilling an easier economic choice (Aguilar, 2011). Thus CHaRM's operating budget of \$500,000 relies on about \$100,000 in annual funding from the City of Boulder; the remaining funds come from the fees the center charges (at the gate and for certain items) and revenue from material sales (Aguilar, 2011).

Said Eric Lombardi in a *Daily Camera* article: "This facility allows people to live according to their convictions. It gives them a place where they don't have to throw things away" (Aguilar, 2011).

4.6. Zero waste enters Boulder's policy vernacular

4.6.1. Head of Eco-Cycle helps to articulate a movement

In 2001, Eco-Cycle's 25th-anniversary year, the nonprofit created the Zero Waste Institute, a "sort of a think tank" with a mission "to do nothing less than convert the throwaway society," according to founder Eric Lombardi (Truini, 2001). The institute started off with \$25,000 from Eco-Cycle and hoped to secure \$1-2 million more from other sources (Truini, 2001). But today it remains little more than a rudimentary web presence. As Eric Lombardi explained, the institute was not able to raise adequate funds to carry out an agenda (personal communication, July 13, 2011).

Lombardi continued to work through other channels to develop and publicize the concept of zero waste. In September of 2001, his *BioCycle* article outlined the five basic tenets of zero waste: "redesigning products and packaging"; "producer responsibility"; "investing in infrastructure, not landfills or incinerators"; "ending taxpayer subsidies for wasteful and polluting industries"; and "creating jobs and new businesses from discards" (Lombardi, 2001a, p. 75).

The following month, *In Business* published an article that Lombardi authored on what he considered a prerequisite of zero waste: producer responsibility. Lombardi (2001b) asserted:

There is a sea change underway in how the world thinks about putting out the trash. The world is facing up to the facts of groundwater pollution from landfills, toxic air pollution from the

burning of waste, and angry citizens organizing ever more into effective groups to protest these violations. These unavoidable realities are driving the search for a large-scale alternative to burying and burning society's discards. An additional factor at play is that the limitations of the recycling revolution of the 1990s are now apparent. The simple truth is that recycling is only an end-of-pipe solution to a problem that has its beginning at the front end of the pipe ... on the designer's desk. (p. 28)

Producer responsibility was becoming an increasingly common theme in discussion of waste reduction. Just a year later, in 2002, *Cradle to Cradle: Remaking the Way We Make Things* came out—the book that emphasized producer responsibility and product redesign to eliminate waste.

Eric Lombardi was a founder and active member of the GrassRoots Recycling Network (GRRN) in the 1990s, helping the nonprofit organization wage waste-reduction campaigns, most notably against Coca-Cola. In 2004, in Oakland, California, GRRN held the country's first national conference on the subject of zero waste (Truini, 2004).

4.6.2. Formal zero waste commitments

In the early 2000s, Eco-Cycle introduced the concept of zero waste to the City of Boulder and urged the city council to adopt zero waste policy—an effort that would bring action within the next few years (E. L. interview).

Zero waste resolutions

In November of 2005, Boulder County passed a resolution with waste-reduction goals for the county: to divert 50 percent of waste from the landfill by 2010 and achieve complete zero waste or “darn near” by 2025. This resolution contained many “whereas” clauses articulating various aspects of the waste problem, including the unfairness of burdening consumers with responsibility for waste reduction, the destructive nature of tax subsidies for waste and virgin material, the jobs-potential of a resource recovery-based economy, the need for producer responsibility and product redesign, and a finite planet Earth (Board of County Commissioners of Boulder County, 2005). Less than a year later, the City of Boulder passed its own zero waste resolution, in April of 2006 (City of Boulder, n.d.d).

Eric Lombardi noted that Eco-Cycle was very instrumental in winning interest in these resolutions, providing the “education and storyline” that would convince elected officials and their staff. But official credit for leadership on the county's resolutions went to a commissioner who needed very little convincing himself, Will Toor, who in 2008 received EcoCycle's Mary Wolff Community Leader Award for “his leadership in making Boulder County one of the first communities in the nation to adopt a Zero Waste resolution” (“Commissioner Toor,” 2008). During Will Toor's tenure as county commissioner, which started in 2004, he ushered in many environmental initiatives including the county government's own pilot zero waste program; a green building code requiring on-site recycling, deconstruction (instead of demolition), and waste reducing measures for new residential construction; and the Boulder County Recycling Center's transition to single-stream technology. Toor had also served two terms as mayor of Boulder paying great attention to public transportation and sustainability, worked with the University of

Colorado's Environmental Center—and took his first job in Boulder at Eco-Cycle more than 30 years ago (Horn, 2010). The local paper described this first job as “a life changing time where [Toor] became focused on sustainability” (Horn, 2010).

Zero waste plans

The City of Boulder released its Waste Reduction Master Plan in April of 2006. This plan—also known informally as the “Zero Waste Master Plan”—is scheduled to be updated every five years. Boulder has held study sessions to identify challenges to address in its 2013 update. One challenge is the low rate of recycling among multi-family residences—a problem not unique to Boulder. But as Kara Mertz explained, “that’s partly because once the private sector took over providing recycling, they didn’t have as strong a requirement generally as we used to have when the city sponsored it, to have kind of on-site recycling contacts” who would take personal responsibility for educating fellow residents and monitoring recycling activity (K. M. interview).

Commercial recycling is another major area that the city will seek to improve. Right now the commercial sector accounts for the majority of Boulder’s waste stream but it does not recycle nearly to the extent that the residential sector does (K. M. interview). Kara Mertz explained that developing commercial recycling policy is more challenging than it is for residential because of the former’s far greater variety in material discards. She also noted that the city wants to be careful to avoid adverse effects on business profitability. Said Mertz, “we are very fortunate in Boulder right now to have a very healthy economy despite what’s going on in the rest of the country and we really don’t want to jeopardize that, obviously.”

Boulder County adopted its own Zero Waste Action Plan in December of 2010. Particularly noteworthy is its support of state-level action, including landfill bans on certain materials (Boulder County, 2010).

Zero waste enthusiasm spreads in the community

The same month that the City of Boulder released its Waste Reduction Master Plan, the EPA formally recognized Eco-Cycle and the local farmers’ market with an award for their joint zero waste initiative (“Boulder’s Eco-Cycle,” 2006). A year earlier, the nonprofit started working with the market to make it the country’s first zero waste venue, replacing trash cans with bins for recyclables and compostables and providing volunteers to educate patrons. The market’s diversion rate is 95 percent; it generates no trash itself and sends to the landfill only non-recyclables brought in by visitors from the outside. Said the EPA of the effort, “They are leading the way and serving as models for others to follow. The EPA hopes this award will draw attention to the possibilities of living in a zero waste world” (“Boulder’s Eco-Cycle,” 2006).

Other local enterprises—some 800 area businesses and institutions—had their own zero waste initiatives (Johnson, 2006). A few months after the city’s resolution passed, Boulder Outlook became the city’s first zero waste hotel, with assistance from Eco-Cycle (Johnson, 2006). The changes cost the hotel an additional \$150 per month in hauling fees and require two extra hours per day in labor for material sorting, plus additional maintenance costs (Johnson, 2006). However, the hotel’s sales also increased by \$25,000 over a three-month period, which the hotel’s owner attributed to travelers seeking to support

an environmentally-responsible business; he concluded, “It’s the best investment I could have made” (Johnson, 2006).

4.6.3. Composting

The City of Boulder’s trash haulers ordinance originally required a dual-stream collection system for households: mixed containers (such as glass jars and plastic bottles) in one bin and mixed paper in another (K. M. interview). These two different types of recyclables would be collected on alternating weeks with the weekly trash service. But the Boulder County recycling center’s later retrofit for single-stream processing meant that households now could place the formerly separated materials—containers and paper—in a single bin for collection, which freed up another household bin.

According to Kara Mertz, the city saw in this an opportunity to add a new material to its trash haulers ordinance. Eventually it was amended to require that residential trash haulers collect compostables (such as fruit and vegetable scraps) in addition to commingled recyclables (K. M. interview).

Although Boulder’s 2000 trash haulers ordinance required haulers to offer curbside compost pick-up from households, the city’s residential compost collection was first introduced as an eight-month pilot project starting in April of 2005 (“Residents Recycle,” 2005). The 400 participating households set out three bins for curbside collection, one each for trash, mixed recyclables, and compostable materials such as kitchen scraps. The 400 participating households ended up recycling a total of 70 percent of their household waste, as opposed to 49 percent on average for the typical Boulder household that lacked access to composting (“Residents Recycle,” 2005). The City of Boulder declared the pilot a success and expanded compost collection city-wide over the next two years.

In 2008, the county followed the city’s lead, updating its own waste haulers ordinance to include a requirement that haulers offer weekly or bi-weekly compostable collection service to customers in certain parts of the unincorporated areas (“Community Meetings,” 2008).

Marna Hibberd, a waste reduction program assistant with the City of Boulder, credited Western Disposal’s “progressive business practices” and Eco-Cycle and Boulder County’s retrofit of the MRF for single-stream processing with enabling the success of residential curbside composting (“Residents Recycle,” 2005).

Despite Boulder’s much-publicized residential composting policy, there is surprisingly little information in local media of what happens to the compostables after they are collected (in contrast to the local composting operation detailed in the Atlanta case study). Eric Lombardi offered an explanation for the current composting situation. The story goes back to 2000 when the City of Boulder passed its trash haulers ordinance, which required that any company collecting trash in the city must also collect recyclables and compostables (E. L. interview). Western Disposal has an effective monopoly as a residential waste hauler in the region. After the ordinance made the company responsible for collecting residential compostables, Western bought some land in the city and built the only composting facility in the Boulder area. The city realized that giving Western a permit to run the composting facility meant giving the company a monopoly in the region, so they granted the permit with one condition: that

Western allow other collectors of residential composting to haul their loads there. But this provision was largely symbolic because Western already served nearly every household in the city (E. L. interview).

But this arrangement did become more an issue for collection of compostables from the city's commercial sector. As Eric Lombardi explained, the City of Boulder's waste stream is 60 percent commercial—but at this point the city has no requirement for commercial composting as it does for residential. Eco-Cycle started offering commercial compost hauling six years earlier and has been losing money on that venture every year because the nearest compost operation was 25 miles north, in Greeley. When Western opened its compost facility, Eco-Cycle still had to make the 50-mile round-trip runs to Greeley because Western was not required by the city to accept commercial compostables at its site—only residential. And Western chose not to allow Eco-Cycle's commercial loads.

According to Lombardi, Western does not advertise that it offers commercial composting because the company does not make a profit from it; "They make far more money landfilling than composting" (E. L. interview). Lombardi asserted that Western mentions its composting service only when commercial customers consider switching to Eco-Cycle. Then Western outbids Eco-Cycle to keep the accounts. Said Lombardi, "we're the only ones in town that want to grow composting—and we can't because Western kills us on every account."

But in a *Daily Camera* article, Western Disposal's president, Gary Horton, offered his own explanation for the firm's behavior:

"We have told the city and the county repeatedly that if they were to put in an ordinance that all haulers provide organics collection to commercial accounts, we would then open up. We're trying to build that business up. If everybody had to do it, then we would say, 'Look, it's better for the community, it's better for the environment if we let other haulers'" use the site. (Urie, 2011a)

4.6.4. *Pay-as-you-throw*

Boulder's zero waste resolutions served as formal declarations of a community that had already seriously committed to waste reduction. The Boulder County Recycling and Composting Authority had previously established a goal of recycling 50 percent of the county's trash by 2005 (Auge, 2000). In 1998, the authority found that it was only halfway toward that original goal and considered options to improve its progress. In 2000, Boulder County considered adopting a pay-as-you throw program, in which customer payments for trash collection vary based on amount discarded, for its unincorporated areas (Auge, 2000). Other nearby localities—including Fort Collins, Larimer County, and Loveland—that had already adopted PAYT were reporting favorable results; Fort Collins found that its trash volume was shrinking even though the county was actually growing, and Loveland's per-day residential trash rate dropped by more than fifty percent (Auge, 2000; "Boulder Lagging," 2000). The City of Boulder adopted PAYT in 2000 with its own new trash hauler's ordinance.

The PAYT decision for Boulder County was more complicated due to the large number (35) of private haulers serving nearly 21,000 households spread out over a large area (Auge, 2000). But in 2008, the

county decided to add PAYT to its new waste haulers ordinance along with other provisions designed to reduce waste and increase recycling in its unincorporated area (with some allowance for variation in service depending on location): single-stream recycling collection, weekly or bi-weekly compostable collection, and a requirement that waste haulers submit annual reports of material tonnage collected (“Community Meetings,” 2008).

The leading authority on PAYT reported in a study for the EPA that over 7,000 communities in the country have adopted PAYT and about 25 percent of the US population is subject to this type of waste pricing system (Skumatz Economic Research Associates, Inc., 2006). According to the report, “the research has demonstrated that PAYT is the most effective single action that can increase recycling and diversion, and can also be one of the most cost-effective” (p. 1).

With regard to PAYT’s effect on private haulers, the study reported that “haulers look for ‘level playing fields’ in service” (p. 12) and that mandating PAYT in an ordinance is a useful tool to help achieve that non-discrimination. In the Boulder area, adoption of PAYT was a challenge but not insurmountable for the dominant private hauler, Western Disposal. According to Bryce Isaacson, Vice President of Marketing for Western, the company already was using its own form of volume-based pricing, which it had adopted voluntarily back when the city required embedding the cost of recycling with trash years earlier. But Western’s difference in price between the 32-, 64-, and 96-gallon carts was only \$1.50, so, Isaacson explained, “it didn’t really give ... the homeowner the incentive to size down in their service and recycle more. ... You have much more motivation at eight dollars than the smaller amount.”

Still, after Boulder County adopted PAYT, Western had to hire four new employees to handle calls from customers who were confused or irritated by the new system (Snider, 2008). Most county households already used a 96-gallon trash container and would need to size down to a 64-gallon container to avoid a higher trash bill after PAYT. But as is typical of pay-as-you-throw programs, these customers would also be allowed unlimited curbside recycling and, in some cases, unlimited composting (Snider, 2008). Thus for most customers the new system was just a matter of shifting much of their discards from trash to recycling and/or composting containers.

In describing the company’s experience with transition under Boulder’s pay-as-you-throw mandate, Bryce Isaacson noted that a privatized, competitive waste management system, as opposed to municipally-run program, creates additional work for haulers:

[Western had to acquire] different [collection] trucks, then you had to have all the different size carts, 32s 64s 96s, without knowing when all the dust settles [which household is] going to have what size. So you have to have more inventory than you would if ... like a municipal program, for example, they may roll it out and the cart stays at the house and never leave[s], meaning if the next person moves in, they just take over the carts that were there before. But in a private subscription, every time somebody moves in or moves out, you go collect your carts, then you wait until the next person moves in, then they change, have a different level of service than the prior homeowners, so then you have to redeliver equipment. So there’s a lot of movement and cleaning and stickering of carts to manage a system like this. (B. I. interview)

4.6.5. *Keeping up with advances in recycling technology*

Starting in the late 1980s, a new recycling practice emerged to become the state of the art: single-stream recycling, in which all materials accepted for recycling are collected and transported mixed together and then processed at a MRF that mechanically separates them. Within the next two decades many recycling facilities across the country would switch out their old collection programs and technology for this new one, including in the city of Denver, Colorado, about 30 minutes from Boulder (Mata, 2005).

A single-stream program makes recycling easier for household residents and haulers because materials no longer need to be separated in different curbside bins or collection-truck compartments. But contamination, or unintentional mixing of different material streams, is a common problem at single-stream MRFs that can result in product of inferior quality.

A 2004 study of scrap-paper processing by independent consultants and compiled by the American Forest & Paper Association (AFPA) found that costs at various points in the system differed in a single-stream program compared with dual-stream. According to the report, for single-stream systems, curbside collection costs were about \$15/ton lower, sorting costs at the MRF were \$10/ton higher, and operating and maintenance costs at mills using recovered scrap from single-stream systems were \$8/ton higher, with a total system-wide increase in expenses of \$3/ton (AFPA, 2004). This report also found that single-stream (SS) systems increased community curbside recycling rates from two to five percentage points—but that contamination reduced this increase to a net of one to three points (AFPA, 2004). As the report observed, “The economic benefits at the collection stage have been the primary driver” (p. 2) of the growth in single-stream programs.” But these benefits do not carry through to the next stage of the recycling process:

Mills, which are finding it very difficult to earn their cost of capital and are facing increased global competition, see increased costs and gain no offsetting rewards, making their situation further challenging. On the other hand, haulers and processors may not be fully aware that SS increases mill costs and, therefore, have not taken steps to assure consistent high quality of SS materials. (p. 33)

In October of 2006, the Boulder County Board of Commissioners approved a \$5 million retrofit of the county’s MRF with the latest technology to handle single-stream processing (“Bid Approved,” 2006). The county’s update to its waste hauler ordinance in 2008 required single-stream recycling collection to accord with the new technology at the MRF (“Community Meetings,” 2008).

Single-stream technology introduces new contamination challenges and the Boulder County Recycling Center saw its share. Plastic bags became the number one problem for the MRF (Collins, 2009a). The mechanism for separating containers from paper routinely clogged with plastic bags that residents had included in their curbside recycling bins. As Marti Matsch, Eco-Cycle’s communications director, explained, “the plastic bags get tangled and wrapped all around the equipment until the sorter doesn’t work anymore and we have to shut down the entire conveyor system, and cut plastic bags off the equipment” (Collins, 2009a). Plastic bags removed from the equipment were too dirty to be recycled

and had to be landfilled. Residents could help avoid this problem by separating out their plastic bags and recycling them at CHaRM or grocery stores with their own recycling programs (Collins, 2009a).

As Jeff Callahan, Manager, Boulder County Resource Conservation Division, noted, the combination of single-streaming and PAYT exacerbated contamination at the MRF:

When you implement the PAYT and the people get very aggressive about it and they get down to the smallest container, 32 gallons for waste, they only have two other options [when] they start creating too much waste—and it either goes into the recycling bin or compost bin. So we get a lot of scrap steel in the recycling bins that shouldn't be here—landscaping edging and car parts and fence pieces and things like that. So those all need to be pulled out. And we're also getting things like durable plastic kids' swimming pools and plastic tricycles, so those materials have to be pulled out. ... With the single-stream system, I don't know, I assume it's the haulers compacting the trucks a little bit more aggressively because they can with the paper products, but we have a tremendous amount of broken glass that is too small for our system to recover. We have a lot of glass that goes out and that's a lot of our weight. Our residue numbers ... went from three to four percent when had our dual-stream [sorting] system. We're up around 16-17 percent of the materials that come into the facility going out the back door as waste. And part of that is contamination, part of it is the inefficiency of the sorting system. (J. C. interview)

Contamination is more than just a problem within the MRF. As Callahan explained, about a year earlier, the Boulder County Recycling Center was contacted by its paper purchasing company because too much glass contaminated the scrap paper from the facility. This prompted the Boulder MRF's operators to modify how the facility's screens function.

When the screen known as the "French banana" filtered out small pieces of paper, separating it from the containers, it was also carrying fine glass along with the paper. That last paper stream was mixed with all the other paper, so too much glass was ending up in the product. To fix this, the MRF's operators changed the openings on the French screen so that it would be less aggressive in separating out paper and allow more material to fall through. But this also had unintended consequences:

So we ended up with a fairly clean paper stream—but the containers coming out of the French screen have a significant amount of paper [mixed in], and when it's at that point in our system we have no ability to recover that paper; it's just containers being separated. So that was state-of-the-art several years ago. Right now I wouldn't buy another French banana screen if you gave one to me. (J. C. interview)

But Callahan observed that "technology has advanced." The MRF is buying a bulk handling-system polishing screen that Callahan was able to see in action and has him convinced that the machine will separate out paper without carrying glass, and also ensure a cleaner container stream.

The MRF's management is looking into optical sorters for plastic, which Callahan has seen in operation in other plants and describes as "very efficient in recovering plastic" (J. C. interview). Such a system would replace the MRF's current use of manual labor to sort plastics. The Boulder recycling center

already has an optical sorter for glass, and is one of the few recycling centers in the country to install one. The story behind that decision illustrates Boulder's recycling ethos and how it differs from corporate recyclers, as Jeff Callahan explained:

Our needs for optical sorting on the glass stems from ... when we had dual stream we were hand-sorting the glass and we were only hand-sorting brown; we separated [glass] out mechanically, and then we hand-sorted the brown glass for a higher price because they pay more for the Coors bottles out here. So at that time we were selling the brown and we were selling all the mixed glass to Coors After receiving material from Eco-Cycle for years, [Coors] came back and, around 2006 I guess it was, indicated that we had too much contamination in the glass, too many stones and ceramics. So we unfortunately began to store glass in our back lot while we tried to figure out what to do, and I ended up with about 8,000 tons of broken glass in our parking glass. Half acre of glass, ten feet high—it was not a pretty sight. So we ended up throwing most of that into the landfill because we couldn't process it and vowed we would never do that again. So it's part of Boulder's ethics. Other facilities will use glass as landfill cover. We're not very supportive of that because it's not the highest and best use [of glass]. So it could be a black eye for the county. So we installed this glass optical sorting specifically so that we would never have that problem again. [Corporate recyclers] Waste Management and Alpine [Disposal] don't have that and aren't considering it because they both manage landfills as part of their overall operations. So their glass goes to the landfill as daily cover. So optical sorting for glass, we're probably quite unique.

4.6.6. *Recycle Row/6400 Arapahoe*

The City of Boulder's latest zero waste directed project is a concept originally called Recycle Row—a plan to cluster many of the region's recycling-related facilities together in one area. As Kara Mertz explained, Boulder wanted to have all of its reuse and recycling centers as co-located as possible in one part of the city, to create “kind of a one-stop shop” for local recycling needs.

Plans for Recycle Row began with a one-mile length of 63rd Street on the city's eastern side (Urie, 2009a). The Boulder County Recycling Center was already located there along with Western Disposal's trash transfer station (where trash is temporarily held before it heads to the landfill) and composting facility. The city did not own those desired lots. In the fall of 2009 the city council increased the trash tax to its maximum to pay for a bond issue to purchase the \$5.45 million property (Urie, 2011b).

On October 18, 2011, Boulder's city council approved annexation of 12.6 acres of the 6400 Arapahoe site, at the same time assigning the appropriate zoning and granting permits for its recycling use (Urie, 2011b). Annexed properties are subject to the city's building codes and regulations “Public Invited,” (2009). The City of Boulder expected sales and use taxes associated with the annexed property to generate \$135,000 a year (Urie, 2009a).

The property itself is located on the eastern edge of the City of Boulder and is more or less centrally located with respect to Boulder County's geographic population center. Kara Mertz acknowledged that

it is not realistic to expect 2400 Arapahoe to serve all of Boulder County equally; “it serves the City of Boulder very well and it serves some of the other communities rather well.”

The existing Boulder County Recycling Center provides the anchor for 6400 Arapahoe. The MRF shares its grounds with the hazardous materials management center operated by Boulder County (K. M. interview). Western Disposal’s facilities are nearby—a transfer station where waste collected by the hauler is temporarily held before it goes to the landfill, and the company’s own composting operation. A couple of city-sponsored drop-off centers that accept wood and yard waste also occupy Western’s property. The area will provide a new home for the Center for Resource Conservation’s ReSource used building materials yard and Eco-Cycle’s CHaRM center and offices. As the project’s plans developed to include more facilities, its physical shape morphed into more of a “Z” than a line so that now it is more likely to be referred to as “6400 Arapahoe” than “Recycle Row” (K. M. interview).

Criticism of the new project

As could be expected with any major project, the city’s plans for 6400 Arapahoe elicited some criticism, although none that would ultimately stymie its progress. “We’re all definitely in favor of zero waste, but the way that this has been handled has been confusing,” said the president of a homeowners’ association for housing near the proposed recycling development (Urie, 2009b). Boulder’s mayor Matt Applebaum acknowledged that the project had moved fast, but responded: “I don’t want to deny there would be some impacts ... but I think it’s very hard to see how those impacts are significant, or any more significant than any other industrial uses that are allowed there” (Urie, 2009b). Boulder’s environmental coordinator, Elizabeth Vasatka, used the community’s recently-adopted zero waste resolution to justify the project’s pace and impacts: “We know that more infrastructure has to be developed for us to make our aggressive zero waste goals” (Urie, 2009b).

Other criticism pointed to 6400 Arapahoe as another costly Boulder idiosyncrasy. In August of 2009, former Boulder mayor Bob Greenlee wrote an op-ed in the *Daily Camera* decrying what he considered to be frivolous local government expenditures, from refreshments at public meetings to the city’s affordable housing program. Greenlee criticized the city for spending about \$6 million on land for “its latest eco-marvel,” Recycle Row—an amount exceeding the \$3.9 million that the Colorado Tennis Facilities paid for the same property a year earlier (Greenlee, 2009). Wrote Greenlee:

It's obvious that Boulder taxpayers don't mind paying lots of money for various things they deem incapable of living without. Unfortunately, the city is often guilty of paying far too much for the many things it covets although taxpayers apparently encourage wasteful spending by not aggressively contesting some city council decisions.

Later, in October of 2011, Bob Greenlee wrote another op-ed, this time protesting Boulder’s ballot measures 2B and 2C. These measures sought voter approval to abandon the existing electric utility that serves the city, Xcel Energy—which sources 60 percent of its electricity from coal—and create a new municipally-owned utility more committed to renewable energy, to be paid for with a tax increase (Snider, 2011). To bolster his case, Greenlee also cited the city’s purchase of the 6400 Arapahoe property as further evidence in what he considered Boulder’s pattern of wasteful municipalization

schemes that local politicians use “to engineer behavior while simultaneously promoting ‘progressive’ political agendas” (Greenlee, 2011). But the following month Boulder voters passed both ballot measures 2B and 2C, albeit by a razor-thin margin, signaling their approval of a new Boulder-owned electric utility and their willingness to tax themselves to create it (Snider, 2011).

Any controversy surrounding the former Recycle Row appears to have dissipated and the project remains, more or less, a point of pride for the community. Kara Mertz said of 6400 Arapahoe, “it really is this amazing kind of patchwork ... of private for-profit, private nonprofit, and government partnerships that help create this resource recovery area of town.” Mertz noted potential for expanding the project to include industrial-ecology development at the site, although no plans are yet underway:

We’ve also talked about wouldn’t it be great if we could create like a recycling market development zone along the industrial properties ... that border this area so that if recycling-focused businesses wanted to locate there they could get some kind of governmental assistance to do that [and use materials recovered at 6400 Arapahoe as inputs]. (K. M. interview)

More immediate concerns for 6400 Arapahoe include how to approach recycling of construction and demolition (C&D) debris and expand organics composting, which, as a group of Boulder County Commissioners noted in an op-ed, together make up “more than a third of the municipal solid waste stream and which must be addressed through commercial recycling and composting options if we are to move toward a Zero Waste future” (Pearlman, Dominico, & Toor, 2009).

The city started site development work at 6400 Arapahoe in September of 2012 (City of Boulder, 2012). It would consult the public during the coming year to decide on uses for unused portions of the property.

4.6.7. Eco-Cycle seeks to extend zero waste beyond Boulder

Eco-Cycle has been a leader in promoting waste reduction and recycling, not only in Boulder but through Executive Director Eric Lombardi’s leadership with the GrassRoots Recycling Network in the 1990s and attempts to create an international Zero Waste Institute in 2001. These organizations did not last. But Lombardi continued to be a ZW ambassador through other activities, including his own articles and interviews on waste-related topics. In 2008, *Newsweek* asked dozens of thinkers for solutions to environmental problems, and named zero waste as number one in their “10 Fixes for the Planet,” featuring an explanation from Eric Lombardi (Underwood, 2008). “Waste is expensive and inefficient,” the article quotes him; “it only appears cheap because the market doesn’t send bills to industry for groundwater pollution and resource depletion” (Underwood, 2008). Lombardi also traveled around the country to educate groups about zero waste.

Now Eric Lombardi has plans to develop an arm of Eco-Cycle into a consulting firm to take zero waste beyond Boulder (personal communication, July 14, 2011).² Central to the effort will be the work of

² Lombardi asked that the details of his plans not be divulged here.

economist Jeffrey Morris, what Lombardi calls “honest economics” typically missing from materials management calculus (personal communication, July 14, 2011).

4.7. Zero Waste in Boulder: A Discussion

A good deal of the credit for any zero waste movement in the United States goes to Boulder where, starting decades ago, much of the early experience, philosophy, and leadership originated. Following is a discussion of major observations and themes that have emerged from Boulder’s experience with zero waste, drawing from the story of the case above and additional material including interviews of the people involved and relevant theory.

4.7.1. *Factors influencing pursuit of zero waste in Boulder*

A progressive politics generated by geography, climate, and industry

In his interview, Eco-Cycle’s Eric Lombardi named three factors that help to explain Boulder’s interest in zero waste. First, it is a college town, a type of community that, he observed, tends toward the politically progressive regardless of location across the country. Second, he noted, Boulder’s “physical beauty” and “perfect weather” combine to form “an outdoor playground. And who can afford an outdoor playground? A lot of rich kids. So that was one of the things that drew the wealth here.” The third factor Lombardi pointed to is Boulder’s concentration of scientific research institutes: “We’ve got more climate scientists here per capita than anywhere else in the world.” Such activity attracts people who are “very intellectual, very progressive, [with] sort of left-liberal politics.” Lombardi says that all three factors:

came together to create what I would call a progressive government structure. So we have progressive staff and progressive city council. And when you have progressive staff and city council, then you get a progressive community. Everybody wants to be on the cutting edge.

The question of wealth

But just how much is Lombardi’s second factor—Boulder’s wealth—responsible? This is an important question with implications for how many other communities can realistically pursue zero waste, at least absent changes on the state, national, or international scene that produce incentives to adopt it. Although Lombardi does not directly say that only a wealthy community can afford zero waste, naming this as one of the three factors implies that Boulder’s wealth is at least partly responsible. Certainly the city and county of Boulder have invested a great deal of money in zero waste, including subsidizing Eco-Cycle’s early efforts (with funds from a surtax on the local landfill before it closed in 1991 at about \$100,000 per year), forgone taxes from Eco-Cycle’s nonprofit status, and infrastructure including a state-of-the-art recycling center and land and buildings for Recycle Row/6400 Arapahoe—all with little protest from constituents.

Housing prices in Boulder are high relative to the rest of Colorado, signaling its desirability. A perpetually popular community like Boulder is much less vulnerable to the economic threats that other communities

face and the difficult fiscal decisions they have to make, particularly during an economic recession. Thus Boulder is continually able to prioritize what many outsiders perceive to be a quixotic pursuit.

Still, although a full accounting of the total spent per capita on zero waste-related activity is not available, the cost of Boulder's zero waste efforts is low relative to other household expenditures for that locality, given the area's housing prices. The City of Boulder's Kara Mertz put the trash tax in perspective:

Even though everything adds up certainly, and I don't want to be cavalier about the impacts of taxes, but I think sometimes the fear of those taxes is worse than the actual impact of them I would say for the most part that on its own, [the trash tax] isn't going to make or break someone's monthly budget. But obviously it needs to be taken in context of other burdens on households and businesses.

A longstanding relationship with the local waste hauler

City of Boulder's Kara Mertz summarizes the relationships across the local waste management landscape:

The fact that Western Disposal started in Boulder County, the people that were the trash truck drivers when Western Disposal started 50 years ago still work for the company, literally So they are a homegrown business that's very dedicated to the kind of values and the future of Boulder. And the same goes for Eco-Cycle and obviously similarly for the city organization. So I would say that each organization's commitment to that has gotten us through kind of the rocky parts of our long marriage.

An influential nonprofit

Clearly, Eco-Cycle is the entity at the heart of Boulder's ZW story. The nonprofit was responsible for the advent of recycling in Boulder when it introduced street-corner drop-off for newspaper and containers. Later Eco-Cycle would develop the influential block-leader program to encourage peer-to-peer education and support for residential recycling, operate the local recycling processing center, and help inform a ZW-agenda for the city and county. Eco-Cycle has been integral in building Boulder's environmentally-responsible image and brand.

Eco-Cycle exerted its influence not only locally, but also state-wide and nationally. The nonprofit's block-leader program was adopted by other communities across the country. Eco-Cycle's executive director, Eric Lombardi, took on leadership roles with the National Recycling Coalition, GrassRoots Recycling Network, and Zero Waste Institute. One of Eco-Cycle's original founders, Pete Grogan, left the nonprofit after 11 years to consult on development of residential recycling programs and serve on the National Recycling Coalition's board, eventually becoming Manager of Market Development and Innovation with the Weyerhaeuser paper company (today, International Paper) (National Recycling Coalition, Inc., n.d.). It was during Grogan's time at Weyerhaeuser that Eco-Cycle entered into a 20-year paper marketing contract with the paper company—the first such price-stabilizing contract in the United States with a

community-based recycler. In 2006, the National Recycling Coalition presented Pete Grogan with its Lifetime Achievement and Recycler of the Year awards (Truini, 2006).

Amenable local government

Another Eco-Cycle alumnus, Will Toor, ascended to positions of influence, first as the mayor of Boulder and then as a Boulder County commissioner where he pursued a sustainability agenda in synch with Eco-Cycle's own ZW goals for the locality. It is clear that Eco-Cycle and the Boulder city and county governments have a highly-intertwined and mutually-reinforcing relationship. Local policy decisions such as the 1981 county landfill surtax, occasional grants when swings in material prices left the nonprofit short on funds, and the contracts with the city and county to operate recycling facilities have all enabled Eco-Cycle to maintain and expand its presence throughout the decades, even as private company Western Disposal moved beyond its original service as a waste hauler to become a major actor in the local recycling scene.

Turnover in elected officials over time has not seemed to diminish the community's allegiance to Eco-Cycle; the decision that came out of the 1998 bidding process for the new MRF was likely influenced to some extent by local residents rallying in favor of Eco-Cycle. To this day, the community remains willing to tax itself to support new waste-reduction projects. In turn, as stated above, Eco-Cycle has helped to build Boulder's unique and—apparently, at least to a critical mass—perpetually desirable green brand.

A largely uninvolved state government

The state of Colorado has played little role in supporting what was unquestionably a local and homegrown zero waste movement. The state presents conditions, albeit not always intentionally, that have made Boulder's ZW efforts all the more challenging. As observed in the story, tipping fees remain low in the state, and it seems that respect for the fabled independent, frontier spirit makes state officials reluctant to impose on local governments even voluntary statewide waste-reduction goals, let alone more forceful policy. But it is not surprising that a state with abundant landfill space would choose not to prioritize waste reduction.

However, the state did attempt recycling-related economic development, as was popular among many other states starting in the 1990s. Colorado worked in conjunction with the EPA to distribute the Jobs Through Recycling grant money, some of which went to Eco-Cycle.

A mildly encouraging federal government

The federal government features only peripherally in this case study, mainly through the EPA's Jobs Through Recycling program grants noted above.

There is another way in which the government might be considered "involved": the wild swings in market prices for recycled materials that plagued local recyclers like Eco-Cycle can be attributed, at least in part, to an absence of action at the upper reaches of government, e.g., through minimum content standards (across more product areas than the Clinton administration's decision on federal paper purchases) or other regulatory interventions that could ensure more consistent demand.

Path dependence

Certainly some degree of path dependence is at work in Boulder. As defined by Levi (1997):

Path dependence has to mean, if it is to mean anything, that once a country or region has started down a track, the costs of reversal are very high. There will be other choice points, but the entrenchments of certain institutional arrangements obstruct an easy reversal of the initial choice. (p. 28)

Pierson (2000) explains the mathematical underpinning of path dependence:

An element of chance (or accident) is combined with a decision rule that links current probabilities to the outcomes of preceding (partly random) sequences. ... Each step along a particular path produces consequences which make the path more attractive for the next round. As such effects begin to accumulate, they generate a powerful virtuous (or vicious) cycle of self-reinforcing activity. (p. 253)

Boulder's investments in infrastructure, including a state-of-the-art MRF and more recent plans for clustered facilities at 6400 Arapahoe, plus its policy commitments in the form of ZW resolutions and strategic plans, predict no deviation from its zero waste course.

But the area's ZW path may be not so much a calculus of increasing returns as it is a force of habit. Boulder city and county's decades-long tradition of environmental and progressive action has generated its own momentum that may lead few residents to question decisions made on their behalf, as former mayor Bob Greenlee criticized in his op-eds. In his piece on the electric utility ballot measures, Greenlee (2011) argued:

After spending over \$880,000 on outside experts and months on narrowly focused outcomes the municipalization scheme still lacks any focus. Some argue it's all about reducing carbon footprints or about enhancing Boulder's "brand." There are also some who simply can't tolerate privately owned utilities because corporations are greedy and make profits and are inherently evil hiding behind the cloak of personhood. Others claim utility customers will enjoy paying lower rates even though that matter remains highly debatable. Over time the municipalizing issue has morphed into a hodge-podge of ill-defined progressive objectives masquerading as enlightened public policy.

Zero waste might present an analogous case. Why exactly is Boulder pursuing it—if landfill scarcity is not a problem there, and no one can argue that a single community's actions will have much effect on global material supply, environmental health, and all the other problems zero waste purports to lessen? Perhaps for the majority of Boulder residents no specific reasons are necessary; it simply has become part of the Boulder tradition extending back to the 1970s with the inception of Eco-Cycle, and even further back with Boulder's pioneering growth management efforts in the 1950s that would set the locality apart in terms of environmental agenda.

4.7.2. *The significance of regulation*

Regulation clearly has played a role throughout the Boulder case study, much more so than will be seen in the Atlanta case. Given the long history and close, relatively amicable nature of the regulators and main regulated entity in the story—the Boulder city and county governments and homegrown, dominant waste hauler Western Disposal—local regulation has remained more or less non-controversial. Kara Mertz offered her perspective:

I totally credit Western Disposal as the primary residential trash hauler in Boulder of being a forward-thinking partner with the city as part of that process. They really did not object to the city regulating them and requiring that they provide this additional service as long as we were regulating all of the trash haulers equally and that they were then on the level playing field ... so they didn't have a competitive disadvantage by providing recycling when the other haulers didn't have to. So as long as it was a level playing field and everyone had the same requirements they were fine with it, and they really worked closely with us to craft an ordinance that would work for them.

Private sector adaptation to regulation

The preceding quote suggests that the private sector can and will adapt to regulation—and certain firms can benefit from it, depending on their capacity to innovate. This is the argument put forth by Porter and van der Linde (1995):

Our central message is that the environment-competitiveness debate has been framed incorrectly. The notion of an inevitable struggle between ecology and the economy grows out of a static view of environmental regulation, in which technology, products, processes and customer needs are all fixed. In this static world, where firms have already made their cost-minimizing choices, environmental regulation inevitably raises costs (p. 97).

The authors later continue: “properly designed environmental standards can trigger innovation that may partially or more than fully offset the costs of complying with them” (p. 98).

As recounted earlier in the case, Boulder's main waste hauler, Western Disposal, not only willingly stepped up to provide professional recycling service when Boulder officially adopted curbside recycling (one of the first communities in the country), but the company also patented its special collection truck—evidence of innovation in response to regulation.

Although Western was able to adapt to new regulation, the experience was not necessarily easy. Bryce Isaacson of Western Disposal gave an example:

So it is a huge challenge, not only for Western. We were fortunate that we wrote our own customer management system so that our software was a little more flexible than probably most trash haulers', because if you had bought off the shelf, like Desert Micro or Soft Pack or something like that, they were never set up back in those days to handle a line item called “trash tax” or to have flat monthly fee and unit charge. They were not that sophisticated. So we

were lucky enough to be able to. Because we still have our own in-house programmers and wrote our system, we probably had more flexibility than other haulers did. And I'll give you an example: to this day, like Republic Waste, on their invoices, they call the trash tax "franchise fee" on their invoice, because they're billing out of their corporate headquarters and their system's not set up to isolate Boulder as this unique, separate entity in their billing process. And so they have collectively decided to call the trash tax a franchise fee for the sake of billing because according to the regulation you have to list it as a separate line item. So computer programming was, I think, a big issue. (B. I. interview)

Given the ways in which regulation can serve the private sector, it might not be surprising that Western Disposal demonstrated a preference for regulation as a means to protect its business interests, as shown in this quote already included in the case but that bears repeating here:

"[Western Disposal has] told the city and the county repeatedly that if they were to put in an ordinance that all haulers provide organics collection to commercial accounts, we would then open up [our composting facility to other haulers]. We're trying to build that business up. If everybody had to do it, then we would say, 'Look, it's better for the community, it's better for the environment if we let other haulers'" use the site. (Urie, 2011a)

Some unique circumstances in Boulder raise the question of whether this adaptation to regulation would necessarily happen everywhere else. As Kara Mertz asserted often in her interview, the very local and long-term nature of Western Disposal's relationship with Boulder accounts for the company's willingness to accept the community's zero waste goals and work with the government to help achieve them. But how many communities have this kind of local company to work with? Larger, national waste companies have steadily infiltrated local markets, often driving out local companies, as recounted in Weinberg, Pellow, and Schnaiberg (2000). Boulder is largely exempt from these concerns because, as explained in the case study, the national companies that operate in the area—Waste Management and Allied Waste—neither have nor want a major share of Boulder's market. San Francisco is another case of a strong zero waste locality that has a rather unique relationship with a local company, Norcal, discussed later.

So questions remain: in areas where national waste companies dominate, what effect would they have on a community's attempt to adopt zero waste? Would they consistently resist and try to steer regulatory decisions away from zero waste, or gamely adapt? As the Atlanta case notes, big waste companies did wield considerable influence in overturning bans on certain materials from landfills in many states when it was in their interest to do so.

The importance of coordinated, integrated policy

Most of the relevant regulation in this story comes from the local governments involved as they steered community behavior to conform to waste-reduction goals. But one policy decision at the national level illustrates the influence of high-level policy changes, rare as they are in the waste-reduction arena: President Clinton's 1993 federal purchasing policy for paper with a minimum recycled content—a development that permanently changed the country's paper recycling and milling landscape by

requiring entirely new milling technology. This is an example of what Ashford and Hall (2011) have described as a “strong” form of the Porter hypothesis:

Stringent regulation can stimulate the entrance of entirely new products and processes into the market, thereby displacing dominant technologies. In this situation, unless incumbent firms have the willingness and capability to produce and compete with the new forms of technology, they too are likely to be displaced from the market. (p. 278)

The systems nature of an economy requires careful policy coordination. As the case recounts, later in the 1990s the increase in local government laws mandating recycling and the ensuing proliferation of recycling programs caused a supply glut of recycled materials—but the absence of corresponding policy to spur demand (such as minimum content standards across a wider variety of materials, within many sectors) for recyclables meant that there were no end markets to absorb that supply. Local governments suffered as they struggled to maintain collection programs while their revenue from material sales dropped.

Ackerman (1997) notes that government harbors contradictory policies: “the paper industry gets one message about where to concentrate its research and development from low-cost opportunities for logging on public lands, and another from requirements for recycled content in government purchasing” (p. 184). Thus any attempt to seek waste-reduction policy at the national level must at least recognize—and, ideally, attempt to remedy—the existence of contradictory ones.

Ashford and Hall (2011) suggest targeting different levels of government for integration of policy goals:

The level of government at which integration is best accomplished ... may depend on the specific socio-technical goal. For example, integration of land-use planning, transportation, and housing is acknowledged to be best accomplished at the urban or local level, while integration of environmental pollution, workplace exposures, and product safety might best be accomplished at the federal/national level. Integration of planning for new industry and job creation initiatives might best be carried out at the regional level and involve state or provincial departments of commerce and labor. (p. 286)

However, evidence from this case study and the next suggest that, at least for waste management, multiple levels of government offer different but complementary interventions that can promote alternative materials management that creates jobs, builds industry, and meets environmental goals such as resource conservation and pollution prevention. For example, recycling infrastructure is inherently a local concern, since such factors as population density, interest of residents, land use planning, and fiscal health of the local government will dictate the type of collection program to adopt and facilities to build. At the state level, decisions such as landfill bans on particular materials, mandatory state-wide waste-diversion goals, state-level grants, and legislation allowing for alternative business models like the L³C can make local efforts easier to pursue. At the national level, action on

minimum content standards and flow-control legislation³ can have a major effect on demand for recovered materials (thus affecting income earned by local recycling operations) and local governments' ability to recoup investments in recycling infrastructure.

4.7.3. The issue of local control over the waste stream (flow control)

Although Boulder officials expressed some concern about ensuring a steady stream of material at the new Boulder County Recycling Center and devised a quasi-flow control method, this preventative measure may not have been necessary, or at least would have little impact. Western Disposal's Bryce Isaacson explained:

That affected us less than anybody else, because our facility, our transfer station, our offices, our whole campus is three quarters of a mile, a mile at most from the Boulder County Recycling Center. We have to drive past it with all our routes, so ... we were least inconvenienced than any other hauler. We were just lucky that it all turned out that way. The haulers that do business and come out of Denver it affected much more dramatically than it affected us. They would come this way and pick up in cities like Louisville and Lafayette before the contracts. There are still HOAs [Homeowners Associations] in those communities that are part of the city programs, so they have their recyclables from those other communities, and now they're rolling into Boulder and adding to those loads, and they had to drop off those loads at the recycle center rather than go back to Denver with them. And Waste Management has their own single stream processing facilities so it would affect them obviously more than some of the other haulers, particularly us.

In sum, said Isaacson of Boulder's quasi-flow control, "Because Western has the majority of the business in Boulder residentially, we had no reason to challenge it. And the other haulers have so little business it wouldn't make any economic sense for anybody to challenge it."

But for other localities, flow control is a much bigger issue with more at stake for both local governments and waste haulers, which is why it often ends up in the courts—including the U.S. Supreme Court, as detailed earlier in the case. Handling even just two or three of the five discard streams (as identified earlier by Eric Lombardi) typically generated in a community requires a great deal of local infrastructure and the funds to build and operate it. Without flow control to help ensure reliable revenue from material sales, a local government may be less likely to gamble on building waste-reduction infrastructure.

4.7.4. Tension between business models

Throughout her interview for this case study, City of Boulder's Kara Mertz suggested that zero waste was a success in Boulder because of the commitment of the three sectors involved: public, private, and nonprofit. Still, tensions emerged from time to time and deserve some examination. Just as Eco-Cycle

³ As noted by Villaneuva (1996): "The only hope for ... local government flow control of municipal solid waste is a clear congressional grant of authority, written in explicit statutory language, authorizing the state and local governments to control the collection, shipment, and disposal of waste" (p. 218).

had complaints about Western (for example, over access to Western's composting operation), Western had some about Eco-Cycle. Bryce Isaacson gave two examples of Eco-Cycle's advantage within the community:

There were three bidders for the operation of the [Boulder County Recycling Center], and then when Eco-Cycle didn't turn in the best bid then [the committee] threw out all the other bids and started negotiating with Eco-Cycle because the bids didn't bear out what they want So then they were awarded that, and there's been since two five-year extensions awarded to them without rebidding it. So not exactly something we think is fair and above-board. Secondly, when they have contracts like that, they use the money they get for running the [MRF] to then extend their arm into the collection business. They have rear load trucks, front load trucks, they collect recyclables and, in some cases, trash. ... Then they hide behind their nonprofit status and undercut the heck out of the for-profit side. ... They don't have to pay any taxes so their rates are naturally substantially lower. The City of Boulder gives them a free place to park their trucks, house their offices, house their people.

Eric Lombardi countered that Western Disposal charges the highest collection rates in the state, "so all we have to do is charge average prices to beat them" (personal communication, April 16, 2013).

Isaacson did, however, acknowledge Eco-Cycle's unique contribution to advances in materials management:

But, again, we coexist because they do some things that we don't. And part of what the services those nonprofits do is they start something that's not economically viable, which Eco-Cycle has done over the years, and then when it becomes economically viable then the private sector steps in and we would like to believe we do it more efficiently. ... We just personally don't think they should be in the hauling portion of the business. They shouldn't operate the processing facility *and* be in the hauling business.

The friction that Eco-Cycle and Western Disposal have exhibited over the years are less personal conflicts than what might be symptoms of more fundamental inadequacies of the traditional business and nonprofit models that often serve as means to public ends.

4.7.5. Alternative models of enterprise

Many theorists have argued for alternative models of enterprise better suited to meeting long-term social or environmental goals. Shuman and Fuller (2005) advocate "entrepreneurial nonprofits"—nonprofit organizations with social missions that, instead of seeking funds from a dwindling supply of charitable donations or grants, fund their activities through subsidiary revenue-generating enterprises (one example is nonprofit Pioneer Human Services in Seattle that provides services to at-risk groups with a \$55 million annual budget funded by its own businesses, including aerospace and sheet-metal industries, food warehouses, and a real-estate management group). Williamson, Imbroscio, and Alperovitz (2002) propose alternative economic structures such as employee- or consumer-owned

cooperatives, community development financial institutions (CDFIs), and municipal enterprise, designed to help economically stabilize communities while meeting broader social needs.

In his interview, Eric Lombardi argued that the reason why San Francisco is so advanced in zero waste is because of the unique relationship between the city government and the local waste hauler, Recology (formerly Norcal). San Francisco passed a waste collection ordinance in the early 1920s that granted exclusive waste collection licenses to Sunset Scavenger and Golden Gate Disposal & Recycling—subsidiaries of Recology, which today still holds that exclusive license with the city (Tam, 2010). Lombardi noted that this gives San Francisco complete control over the contract with Recology. “I think this whole idea of making zero waste a utility, kind of like your local electricity, is a very powerful idea. And that’s what they’ve done in San Francisco” (E. L. interview).

Eric Lombardi acknowledged that San Francisco’s unusually close relationship with Recology and the unique historical circumstances under which a private company could be written into an ordinance are unrealistic for other communities. But he does see promise for a relatively new alternative business model that could be more widely adopted: the L³C.

The L³C

As described by its championing organization, Americans for Community Development (ACD), the low-profit limited liability company (L³C) “is not a nonprofit. It is a for profit venture that under its state charter must have a primary goal of performing a socially beneficial purpose, not earning money” (Lang, n.d.b).

Eric Lombardi explained how the L³C can institutionalize the elusive, meaningful double-bottom line that can help meet the multiple goals of sustainability:

I talk about this differently than most people because I’m really focused on creating what I call a legal double-bottom line, not a PR [public relations] double-bottom line or PR triple-bottom line. ... Right now we have legal single-bottom line structures; they’re called C corps, S corps, LLCs. If you’re going to start a business, those are your three primary choices. And the fourth one is just doing business as an individual. So you’ve got really three legal vehicles that the IRS recognizes and treats you differently on a tax basis.

Well, I want a fourth one: I want a double-bottom line social enterprise vehicle called the L³C. And so to me, triple-bottom line, all the stuff you read about triple-bottom line, it’s all wishful thinking, it’s all greenwash, it’s all fantasy, there’s nothing legal about it—they’re not even trying to get legal. That community’s not even talking about legalizing the triple bottom line. They’re just talking about it as an aspirational goal, that’s what we all should be trying to do.

... Let’s create a legal organization that has to commit to doing something other than just profit. And so let’s start small, let’s just go double-bottom line, and it’s community benefit, and you can define that as environmental if you want or social—either one, you pick. You don’t

have to do both. And the order of those two is critical, because the community benefit has to come first, profit second. And that should have to be codified in the IRS tax code.

Shuman and Fuller (2005) caution that traditional dependence on foundation grants can distort nonprofit missions and siphon their leaders' focus and energy by requiring them to constantly compete for traditionally small, short-term foundation grants. But the L³C seeks funding from a different source of foundation money—their program-related investments (PRIs) (Lang, n.d.a). PRIs are investments that foundations can make to support charitable activities that have potential to earn a return, unlike the typical grant, and PRIs give recipients access to capital at lower rates (Foundation Center, n.d.). Lang (n.d.a) explained how PRI investing can leverage other sources of private funding:

L³C's facilitate PRI investment along with tranching (layered) investing where the PRI usually takes the first risk position thereby reducing risk for other investors in higher return tranches. These tranches become more attractive to commercial investment because the high risk tranche investor has improved the credit rating of the entire structure and thereby lowered the total cost of capital. In a normal tranching structure the high risk investor (venture capitalist) usually takes a large piece of the ownership and asks for a high rate of return to offset the significant number of losses they incur overall. If a foundation granting a PRI takes the first loss position with a low rate of return without asking for a big piece, the social enterprise that would normally operate in the red can become self sustaining. (p. 4)

L³C model state legislation was written to mesh seamlessly with IRS regulations governing PRIs, to encourage more of this kind of investment (Lang, n.d.a). Robert Lang, the L³C's creator, acknowledged that the L³C has been slow to catch on after the first state law providing for it passed in 2008, but noted that the Great Recession "has made it challenging to finance any venture let alone a new one built upon a relatively untried structure" (Lang, n.d.a, p. 1).

4.7.6. The implicit goal of broader change

The laboratory function of local government

Logically, if often tacitly, a major goal of zero waste is to ensure its broadest-possible application. Obviously Boulder harbors no illusions that its actions will solve all the world's waste problems single-handedly. Yet the city and county do not explicitly claim to serve as an example for other localities or signal their willingness to collaborate with other jurisdictions beyond the county's borders.

Still, if by default rather than design, Boulder is following a tradition in our federal (i.e., tiered—national, state, local) system of government whereby smaller units of government sometimes serve as laboratories for policy or practice for eventual adoption by other governments, at the same level or higher, as first noted by Justice Brandeis in his dissenting opinion in *New State Ice Co. v. Liebmann* (1932). For example, starting in the 1960s, California developed a reputation as the first state to enact many kinds of environmental laws and policies that later spread to other states, such as regulating vehicle hydrocarbon emissions and setting air quality standards for suspended particulates and other pollutants, and passing legislation to limit greenhouse gas emissions (Schmidt, 2007). In an example

from a different policy area, Massachusetts' experience with its 2006 near-universal health care law informed the contents of the national health care legislation signed by President Obama in 2010 (Patel & McDonough, 2010).

The ZW experiences of early-adopting communities like Boulder are serving as laboratories for next-level materials management. The executive director of the locality's recycling nonprofit, Eco-Cycle, has traveled to other communities to share Boulder's experience with zero waste, although not as an envoy of the city or county government.

Boulder and other communities that switched to single-stream recycling and/or composting programs are contributing to a laboratory effect in another way. Ackerman (1997) makes the case for deliberate waste reduction effort even in times like now when resource scarcity poses no imminent threat. In response to the question, "can recycling 'before we have to' play a role in reaching the long-term destination of sustainability?" (p. 182), Ackerman asserts that recycling today makes two important contributions to the future: "one concerns the evolution of technology, and the other involves the nature of human values and behavior" (p. 182).

Regarding the evolution of technology, Ackerman (1997) observes that markets do not necessarily achieve efficient outcomes, citing as examples like the QWERTY keyboard and the standards for connecting to networks:

Once any approach becomes dominant, the snowballing advantages of accumulated engineering knowledge, production skills, and consumer acceptance make it hard for alternatives to catch up. The basic decisions about resource use may therefore be made in the initial choice of the winning technology, not in the later details of the implementation" (p. 183)

Ackerman continues:

Recycling efforts are important in this respect; they can help determine which new technologies get a head start and become dominant in the future. By acting as if materials are more valuable than the market thinks they are, and by creating legislative and grassroots pressure to make use of recovered wastes, recycling helps select which learning curves industry will slide down next. (p. 183)

Regarding human values and behavior, and consistent with the "laboratory" function described earlier, Ackerman (1997) argues that recycling serves as "social experimentation aimed at reducing uncertainty by developing the technologies that will be needed to ease a future transition to a regime of resource scarcity" (p. 184).⁴ This might not be Boulder's explicit motivation, but it is hard to imagine the city and county not agreeing that their essentially moral pursuit of zero waste also generates a byproduct of valuable learning experience to help others beyond their borders. Thus Boulder's perpetual willingness to install state-of-the-art technology in its recycling center and experiment with new facilities and programs provide valuable feedback for firms that manufacture and advance recycling technology (e.g.,

⁴ A key word in this quote is "social." As will be explored in the discussion section of the Atlanta case study, the most common motivation for recycling does indeed have profoundly social roots.

as with the French banana screen incident at the Boulder MRF) and other communities that might someday have a real need to adopt a zero waste approach.

There is some degree of altruism in this role as early experimenter, which would account for its rarity. The literature indeed suggests that lower levels of governments generally are unwilling to assume this laboratory function. As Galle and Leahy (2009) observe, “at this point, there is a strong theoretical argument—backed by some empirical findings—that, absent outside intervention, state and local governments will on the whole innovate at well below the socially optimal level” (p. 1398).⁵ Federalism critic Rose-Ackerman (1980) offers two reasons for this: the costliness of innovation discourages governments from experimenting so they chose instead to free ride on others’ efforts, and the risk-averse nature of incumbent public officials makes them avoid experimentation that might benefit their jurisdictions but that alternatively could lead to their personal punishment. Galle and Leahy (2009) conclude, “there is at least a large grain of truth to [Rose-Ackerman’s] assessment” (p. 1339).

4.7.7. The necessity of a multi-level, integrated approach to achieve zero waste

If the broadest possible application of zero waste is an implicit goal of its advocates, but local governments are not likely to innovate sufficiently, then an important question for these advocates is, what alternative approaches should they take? ZW theorist Eric Lombardi is perhaps the most visionary in terms of thinking beyond the local policy and infrastructure that tend to preoccupy municipalities focused on reducing waste; he acknowledges the importance of product and packaging redesign and producer responsibility. Boulder’s official ZW resolutions also recognized these concepts as central to zero waste. But what remains unclear is the strategy necessary to achieve such policies. Presumably this is because they require action on a state or, more likely, national level—and zero waste, at least right now in the United States, remains almost exclusively a localized concern, because waste management is.

This raises more questions: is it possible that by concentrating their efforts on local governments and not organizing to seek state or national action, ZW advocates are inadvertently sending the message that zero waste should remain strictly a local concern, without complementary state and national policies? And, given the realities of path dependency, will this focus ensure that zero waste stagnates as patchy, isolated efforts spread among localities that pursue it for more-or-less pragmatic (e.g., Nantucket) or more fundamentally moral (e.g., Boulder or San Francisco) reasons?

Galle and Leahy (2009) suggest that a federal role may be necessary in some circumstances:

State and local governments do innovate. But they are unlikely to innovate in all instances at the optimal social level, or in a way that captures the true benefits of experimentation. Accordingly, there is a case for federal intervention, either to correct some of the dysfunction of the market for state government, or to displace it with a top-down federal model. (p. 1339)

But Ashford and Hall (2011) caution:

⁵ One example come across during research for this case study is the anecdote of a state legislator who, after hearing testimony encouraging the state’s early embrace of the new L³C business model, responded, “I don’t cotton much to [being] number one. I prefer to be number 25” (Lang, n.d.a, p. 1).

It may be unreasonable to expect that government can play too definitive a ‘futures making’ role. There is a great deal of serendipity and uncertainty in industrial transformation processes, and the long-term prospects may not be sufficiently definable to suggest obvious pathways or trajectories for the needed transformations. Rather than attempting tight management of the pathways or trajectories for the needed transformations that may lead to sustainable development, the government role might be better conceived as one of ‘enabling’ or ‘facilitating’ change. (p. 285)

This is exactly the role that the EPA has assumed with respect to zero waste, with its WasteWise website compiling data and experiences from self-initiated community and business waste-reduction efforts from which others can learn (U.S. EPA, n.d.e). This facilitating role also explains why the EPA makes a point of presenting awards for innovations in materials management, as in the case of Eco-Cycle and the Boulder farmers’ market and, as will be seen in the Atlanta case, for the first Zero Waste Zone. The EPA recognized the value of such experiments at a time when, as it noted in *The Road Ahead* (2009), “there is no comprehensive materials management strategy at the Federal level” (p. iii) and “governments at all levels need to make systematic efforts to enable, encourage, and collaborate with all parts of society, including business and consumers, to ensure that materials are used more efficiently and effectively” (p. iii).

Ashford and Hall (2001) argue the importance of attending to and connecting all dimensions of sustainability:

National governments must integrate their environmental, social, and economic policies, and this integration needs to be of a particular kind. Major, non-incremental advances can be achieved deliberately, even if piecemeal, by connecting key interventions, policies, and agency missions relevant to a specific policy domain. (p. 272)

An experience from the Boulder case—the EPA’s Jobs Through Recycling program—offers some insight into problems that arise when this kind of integration is absent. Although apparently no assessment of JTR is publicly available, the EPA (1999) did produce a piece of literature based on input from JTR participants that describes itself as a “booklet” with “tips” such as, “learn about economic development if it is new to you” (p. 2), “consider joint implementation of projects” (p. 5), and “develop an outreach strategy” (p. 11). These tips are certainly helpful, but this booklet seemed to imply that following its advice will guarantee success; it makes little acknowledgement of factors beyond a community’s control (e.g., wildly fluctuating prices for recovered materials due to lack of policies to promote demand) that can stymie efforts, no matter how diligently project staff members approach their task.

What might be more useful than tips from participants who themselves have, in many cases, barely begun their JTR experiences, is hard data and longer-term analysis of the outcomes of those experiences. How many jobs were created, and of what quality? What was their economic multiplier? How long did these jobs last? What were the net environmental impacts? What forces—e.g., advances in recycling technology or international trade policy—affected the success or failure of JTR projects, and what were their specific effects? Apparently, no such evaluation for the JTR program exists. But perhaps

this was inevitable; the EPA, as an agency tasked with environmental protection, naturally is not in a position to serve as the main administrator or evaluator of a program that includes an important economic development component.

The apparent failure of JTR suggests the need for proper assistance coming from the federal level or perhaps better idea-sharing among states to achieve coherent policy integration—in this case, integration of economic development along with the EPA’s relevant environmental program expertise. It should be noted, however, that the EPA’s emerging interest in lifecycle materials management is itself a departure from the agency’s historically end-of-pipe approach to pollution control, including waste management. The agency is still very much in learning mode at this point, which accounts for its interest in encouraging local experimentation, as in Atlanta.

Policy integration is the logical necessity for achieving sustainable development—the concept generally accepted as comprising three essential elements of economic, social, and environmental concerns (United Nations, 2005; Ashford & Hall, 2011). Eric Lombardi pointed out that it is difficult for any single enterprise, including his own Eco-Cycle, to pursue all three at the same time under the so-called “triple bottom line” (E. L. interview). The difficulties encountered by the community-based recycling ventures profiled by Weinberg, Pellow, and Schnaiberg (2000) confirm the challenges of achieving multiple sustainability goals through isolated materials-management efforts. Of course, ideally, no single organization or community should be burdened with achieving all facets of sustainability all on its own, but should contribute what it can within a supportive structure of complementary policies at appropriate levels of government.

4.7.8. Path dependence, part II

Path dependence played a role in shuttling Boulder to a position of ZW leadership. A different path dependence question is relevant: the future direction of the zero waste movement in general, beyond Boulder’s borders. That, after all, is the goal of ZW advocates like Eric Lombardi who have written about the necessity of product redesign and producer responsibility.

In the United States it is taken for granted that waste reduction primarily should be the responsibility of the household and local government. However, alternative paths to effective materials management are conceivable—one, for example, where the federal government concentrates on setting waste reduction targets for producers to meet using methods of their choice.

But this raises a disturbing notion: Perhaps early, community-based efforts like Boulder’s inadvertently established the precedent and trajectory that would make the consumer/household/local government focus of recycling the norm nationwide—one that would become so ingrained that it would be difficult for many to think beyond in later years when such thinking would be necessary to progress to more effective materials management.

The career of one of Eco-Cycle’s founders, Pete Grogan, seems to exemplify this trajectory. After spending more than a decade working with Eco-Cycle, Grogan’s consulting work helped other communities develop recycling programs. He spent 10 years on the board of the National Recycling

Coalition—the very organization that his former Eco-Cycle colleague, Eric Lombardi, criticized in his interview for its reluctance to embrace minimum content standards. Grogan’s activity in the corporate world with Weyerhaeuser concentrated on big companies “such as Wal-Mart Stores Inc. and Office Depot Inc. [helping] them reach their recycling and conservation goals” (Truini, 2006).

The key word is “their” —not “our” broader societal goals defined through democratic processes, goals that consider the interests of those affected by externalities of resource use but without any direct control over corporate decisions. Government (city and county) was an integral part of the local movement that Grogan helped to found in Boulder—but a role for government (at the state or national levels that can most effectively address externalities) seems notably absent from his work beyond Boulder with the NRC and major corporations. The discussion for the Atlanta case study will explore this idea of responsibility further.

Eco-Cycle and other community-based recycling pioneers show admirable dedication to sustainability in often challenging circumstances. The restricted spheres of their efforts, however, raise some questions about the more general future of materials management. This observation is not to single out or demean the work of any one individual or organization. Rather it seeks to illuminate how deeply ingrained the common assumptions about responsibility for materials management are in this country, even among those most genuinely concerned about resource use. Questioning this status quo is necessary for understanding how to approach next steps in materials management. Pierson (2000) argues that the sequencing of events is important, because “earlier events matter much more than later ones, and hence different sequences may produce different outcomes. In these processes, history matters” (p. 253).

5. Case Study 2: Atlanta's Zero Waste Zones

The Zero Waste Zones (ZWWs) established in the Atlanta metro area starting in 2008 make up one of the most unique waste-reduction efforts in the United States. Unlike in other areas of the country, zero waste in Atlanta did not emerge in response to an immediate landfill closure or a state mandate. In this way it was more like Boulder's experience: the drive for change came from a few environmentalists determined to minimize material waste in a specific community. But Atlanta's case differs in important ways from Boulder's. First, zero waste efforts in Atlanta targeted the local hospitality and foodservice industries, instead of multiple sectors. Second, while advocates in Boulder harnessed the powers of local government to tax, subsidize, and regulate, Atlanta's zero waste leadership recruited the city's businesses as its primary agents of change, keeping the municipal government less involved. Table 3 provides a condensed timeline of events relevant to the case.

5.1. Background

It is helpful to review recent solid waste management history in the state of Georgia for context to understand why the ZWWs emerged.

5.1.1. Growing concerns about solid waste in Georgia

Like many states during the 1980s and 1990s, Georgia started to feel the pressure of diminishing landfill capacity within its borders. But in Georgia's case—a state with a great deal more open space than many others—the concern was more attributable to a shortage of landfills able to comply with impending new environmental requirements and growing “not in my backyard” (NIMBY) sentiment.

In 1991, the federal Environmental Protection Agency announced new regulations to combat the problem of landfill leachate contaminating groundwater (Luton, 1996). The rules, many of which required compliance by October 1993, forced MSW landfill owners to install costly technology to protect water supplies, including double linings and leachate collection systems (Goldberg & McCarthy, 1993). A special report on “Georgia's Landfill Crisis” in the *Atlanta Journal and Constitution* dubbed 1993 “The Year of the Landfill” for the state's local governments (Goldberg & McCarthy, 1993). According to the report, Georgia's Environmental Protection Division predicted that half of the state's 18 landfills that accepted residential trash would close because many local governments could not afford the new, higher operating costs (Goldberg & McCarthy, 1993).

The state's local governments faced another challenge in NIMBYism. According to the *Atlanta Journal and Constitution* story, “many local politicians trying to site new landfills are finding themselves up against increasingly well-organized opposition Even landfills with the capacity for more garbage are being forced to close” (Goldberg & McCarthy, 1993). The article reported that Atlanta's City Council

Table 3: Atlanta Zero Waste Case Timeline

<i>STATE CONCERNS ITSELF WITH SOLID WASTE MANAGEMENT</i>	
1990	Georgia passes Comprehensive Solid Waste Management Act with goal of decreasing solid waste disposal by 25% by 1996
1993	Many of EPA's new landfill regulations take effect
1996	State ban on yard waste in landfills takes effect
2002	U of GA issues commercial food waste composting feasibility study for South Metro Atlanta
2005	Georgia conducts statewide waste characterization study Georgia withdraws statewide waste reduction goal set in 1996
2006	Georgia EPD holds stakeholder meeting to discuss problem of food waste in greater Atlanta
<i>A PROJECT IDEA BUILDS</i>	
2008	Atlanta loses a convention to another city for not being green enough Holly Elmore establishes the Green Foodservice Alliance, future home of ZWZ projects Holly Elmore convenes meeting at state Dept. of Ag. with EPA, state agencies, nonprofits to accelerate permitting process for commercial food waste composting operation Greenco Environmental becomes first commercial food waste composter in state
<i>ZERO WASTE ZONES FORM</i>	
2009	ZWZ-Downtown Atlanta launches ZWZ-Buckhead launches EPA honors ZWZ-Downtown Atlanta team with Strengthening OSWER Partnerships Award ZWZ-Off Premises Catering launches Fifth Group's ECCO becomes Atlanta's first Dumpster-free restaurant Fifth Group's waste-reduction effort is featured in front-page <i>New York Times</i> story ZWZ-Midtown launches
<i>ELEMENTAL IMPACT FORMS PARTNERSHIPS, DEVELOPS MORE PROJECTS</i>	
2010	Holly Elmore's Elemental Impact forms as Georgia nonprofit corporation Hyatt Regency receives Georgia Hotel and Lodging Association's 2009 Good Earthkeeping Award Holly Elmore debuts compost presentation at National Restaurant Association show Waste Management invites Holly Elmore to educate staff on importance of zero waste
2011	Georgia repeals ban on yard waste in landfills due to pressure from waste management industry Elemental Impact launches Sustainable Food Court Initiative with National Restaurant Association City of Atlanta signs on as ZWZ participant City of Atlanta adds compostable serviceware and source separation requirements to airport concessions RFP due in part to pressure from Holly Elmore Atlanta airport's Sustainable Food Court Initiative wins the national 2011 Going Green Airports Award Waste Management decides not to renew support of Elemental Impact ZWZ-National Zone launches with projects in Atlanta, Tampa, and Charlotte
2012	The National Restaurant Association acquires the Zero Waste Zone program

voted to close a landfill that still had several years of disposal space remaining, and quoted a county commissioner as saying that it was now “impossible” to site a landfill in exurban Atlanta.

5.1.2. New legislation for state solid waste management

In 1990, the Georgia state legislature passed the Comprehensive Solid Waste Management Act (CSWMA) to encourage local governments to prepare for the upcoming federal landfill regulations and generally improve solid waste management at both the state and local levels (“Georgia Comprehensive,” 2004). Following are some key features of the law.

State-wide waste reduction goal. The CSWMA introduced a statewide goal of reducing per-capita solid waste disposal by 25% by 1996, using 1992 as the baseline year (“Georgia Comprehensive,” 2004). But there was no real plan for achieving this ambitious goal that was apparently to be met mainly through unspecified, uncoordinated efforts of local governments.

Local-level waste management plans. The law required local governments, either separately or in regional partnerships, to prepare detailed, 10-year plans for waste management and reduction. The plans were to provide for at least 10 years of solid-waste disposal capacity, ensure an environmentally-sound solid waste collection system, and describe how the local government would contribute to the state’s 25% reduction goal (“Georgia Comprehensive,” 2004). Fifteen years later the state issued Minimum Planning Standards that expand on the elements to include in the plan, for example, information on the jurisdiction’s various waste collection ordinances and agreements, an inventory of facilities and programs for handling special recyclables like electronics, and an implementation schedule for current and future programs (Georgia Department of Community Affairs, n.d.a).

Yard waste ban. Following the national trend banning yard waste from landfills, the CSWMA itself acknowledged that there were better uses for yard trimmings—a significant contributor to landfills that in 2010 was the third largest category of MSW at over 13 percent, per national average figures from the EPA (n.d.b). According to the original legislative intent, “The productivity of the soils of Georgia requires that nature’s way of recycling vegetative matter be respected and followed and that such essential building materials are no longer wasted by being buried in landfills but are returned to the soil” (“Georgia Comprehensive,” 2004). Georgia’s yard waste ban, which took effect in 2006, applied to all landfills in the state with a few exceptions including a special category of inert landfills—those that can accept only “earth and earth-like products” (p. 171) such as bricks, cured asphalt, and concrete (“Conservation HB 247,” 2012).

The CSWMA as originally passed proposed a hierarchy of seven options for dealing with yard waste, starting with the most preferred, “naturalized, low-maintenance landscaping requiring little or no cutting,” and ending with the least desirable, “chipping woody material for later use as fiber fuel” (“Guidance Document,” n.d.). In between were various types of passive decomposition and active composting, on and off site. This hierarchy would change significantly with repeal of the yard waste ban in 2011 resulting from shifts in opinion on “highest use” of recoverable materials and pressure from landfill owners experiencing a loss of revenue from declining waste disposal (“Georgia Comprehensive,” 2004; “Landfill yard trimmings,” 2011).

Recycling market development council. The law also established a 15-member council drawn from industry and state and local government officials to recommend actions for developing and expanding markets for the state's recyclable materials ("Georgia Comprehensive," 2004). The council was designed to disband after five years if not reauthorized.

Criticism of the CSWMA

In the month following passage of the CSWMA *The Atlanta Journal and Constitution* published an op-ed critical of the new law by Hugh Esco of the Georgia Environmental Project, a grassroots organization. Esco (1990) asserted that "The bill wrongly assumes that the root of our garbage problem is a lack of disposal capacity, rather than an excess of trash." He argued that the act's requirement that local governments demonstrate adequate 10-year disposal capacity simply postpones landfill capacity problems for several more years.

The op-ed identifies a lack of markets for recyclable materials as the reason why they continued to consume valuable landfill space. Esco (1990) called the new law's creation of the market development council "a step in the right direction" but predicted the council's ineffectiveness, noting that it is required to meet only once a year and issue a report of recommendations. He argued that it would have been more constructive to task the council with "methodically identifying and recruiting industries to process all the potentially recoverable materials in the waste stream" (Esco, 1990)

Hugh Esco (1990) connected these weaknesses in the CSWMA to the imbalance of power that shaped it, noting that the \$17 billion garbage disposal industry had 17 lobbyists representing its interests during that year's General Assembly session while recycling business had only one registered lobbyist. "The garbage problem isn't really an environmental or technological problem," he stated, "it is a political problem" (Esco, 1990). The op-ed concluded that, given the state's record of granting licenses for construction of landfills and incinerators without allowing citizen opposition to influence the decisions, the planning level is where citizen groups should concentrate their efforts, before waste disposal projects have the chance to reach the permitting process.

5.1.3. Georgia's first major waste characterization study

As the state's local governments developed their 10-year solid waste management plans required by the CSWMA, Georgia's Department of Community Affairs (DCA) learned that municipalities and counties often lacked the resources to gather the necessary data on waste produced in their jurisdictions (DCA 2005). These local governments would turn to alternative data sources, including national or other state data, to estimate the composition of their own waste streams (DCA, 2005). But the likely inaccuracy of these data could misguide solid waste management efforts (such as deciding whether to retrofit recycling facilities) and make it more difficult for local governments to plan for and fund them (DCA, 2005).

Thus DCA performed a statewide waste characterization study to provide more location-specific data for local solid waste management planning (DCA, 2005). The study determined the composition of state's overall waste stream and broke it down by Georgia's 16 Regional Development Centers (RDC), which are

smaller geographical groupings of counties (DCA, 2005). It also looked at the waste composition for several categories of recoverable material. The state could use the resulting data to measure progress and target policy toward the original solid waste reduction goal established by the CSWMA, which had been passed 15 years earlier (DCA, 2005).

The study made several important findings. Researchers learned that nearly 40 percent of the disposed municipal solid waste stream was made up of materials for which recycling programs typically existed in the state: paper (the largest share, at 25 percent of the disposed waste stream) followed by metals, glass, and plastics (DCA, 2005). The report concluded, “this suggests the State may be able to increase diversion from landfills by evaluating recycling market development strategies, recycling outreach activities, and residential recycling incentive programs” (p. 4-6).

The study also found that the largest single component of the disposed waste stream—a material with no significant recovery efforts in the state at that time—was food waste, at 12 percent (DCA, 2005). The greater Atlanta area (as represented by the Atlanta Regional Commission RDC) was responsible for the largest regional share of the state’s disposed food waste, at about 48 percent (DCA, 2005).

Georgia’s state-level reporting system traditionally had not tracked waste generation separately by sector, i.e., residential or commercial, but the study’s authors were able to provide estimates for this breakdown in cases where they were unsure of the split when sampling disposed waste. As the study’s methodology section notes, nationally “the MSW stream split between residential and commercial waste most often ranges between 60:40 and 40:60 residential to commercial waste” (p. 3-4). The study found that food waste, paper, cardboard, and plastic film ranked among the top five most prevalent materials in the waste streams of both the residential and commercial sectors (DCA, 2005). Although the two sectors differed to some extent in the types and amounts of materials they discarded, and it was impossible for the study to calculate exact amounts from each, it is noteworthy that the two sectors were fairly matched as contributors to the state’s solid waste volume—a reality rarely reflected in recycling policy, which tends to focus on the residential sector.

5.1.4. Big waste generators under the radar

An examination of Georgia’s early solid waste reports, which the CSWMA directs the state to produce on an annual basis, finds state and local preoccupation with solid waste produced by the residential sector, with little mention of the commercial and industrial sectors. For example, the FY 1996 report (which also served as the first five-year retrospective) noted that residents have access to improved, privatized waste collection service, and more governments are educating residents on solid waste issues. But the same report also acknowledged the need to redirect—or at least expand—focus. Its section on “New directions in Solid Waste Management” notes “several issues that the State must address in the future have emerged” that “will form the basis of the State’s activities over the coming years” (DCA, 1997, p. 12). Among the items was “increased focus on solid waste and recyclables produced by the commercial and industrial sectors” (p. 12). Here the state indicated that it was aware of the actual residential/commercial split in waste generation—in a report published about a decade before the 2005 waste characterization study:

During most of the 1990s, the State focused its waste reduction efforts on local governments, which primarily serve the residential sector. Because the networks for educating and assisting local governments were well established, solid waste management planners believed this approach to be the most direct and the most likely to elicit strong initial results. The approach was flawed, however, in that about 60% of the State's solid waste is produced by businesses and industries. (p. 12)

Despite the state's acknowledgement that commercial and industrial waste should receive attention, Georgia's continued emphasis on residential solid waste meant that waste management remained more or less unchanged for some of the state's biggest waste generators. This fact was reflected in a series of studies issued by the University of Georgia's College of Agricultural & Environmental Sciences in the early 2000s. These studies, produced by the school's Engineering Outreach Service for Georgia's Department of Natural Resources, explored the potential for alternatives to landfilling recoverable materials from particular sectors or geographic areas—including South Atlanta's biggest food waste generators, mainly the industrial-sector food processors (Faucette & Governo, 2003). But absent any legislative mandates, very few recovery efforts have materialized.

The state's latest Solid Waste Management Plan, last updated in 2006, reinforces this state of affairs:

The focus of the plan is on municipal solid waste (MSW), as it is defined in state law. As such, it includes household and commercial solid wastes, as well as yard trimmings and construction and demolition waste, but does not include solid waste from mining, agricultural, or silvicultural operations or industrial processes or operations. (p. 2-1)

The management plan also acknowledged that many unknowns remain regarding the amounts and impacts of industrial waste in on-site landfills and yard waste in inert landfills, among other types of untracked disposal.

5.1.5. Momentum slows for landfill diversion

The state of Georgia failed to meet its goal of reducing disposal of waste in landfills by 25 percent by 1996 (DCA, 2007). The state legislature eventually withdrew the goal and revised the statute to read more vaguely and less ambitiously, "It is the intent of the General Assembly that every effort be undertaken to reduce on a state-wide per capita basis the amount of municipal solid waste being received at disposal facilities" (DCA, n.d.a).

The original goal lost its urgency as the landfill space crisis and tipping fee increases failed to materialize despite authoritative warnings that continued even into the 2000s. (For example, the University of Georgia's 2002 *Comprehensive Survey of Georgia's Compost Industry* cited landfill closures and increases in landfill tipping fees among the reasons for "the need for organics recycling" [Governo, Thompson, Faucette, & Das, p. 6].) In nearly two decades after passage of the CSWMA, projections of remaining MSW landfill capacity have actually increased and tipping fees have remained fairly constant, as Georgia's solid waste annual reports document.

A couple of important trends helped to lessen concerns about landfill capacity, both driven at least in part by the more stringent federal environmental regulations imposed on landfills in the early 1990s. First is privatization of solid waste management. Where local governments lacked the money, staff, and state support to adopt and manage newly mandated landfill technology, the private sector was able to take over with more abundant resources. The remaining local governments owning landfills tended to run them more like businesses using the enterprise funds model (DCA, 1997).

The second trend is fewer but bigger landfills. Larger landfills allow economies of scale that lower the per-unit cost of landfill operation. These larger landfills tend to be privately owned (intersecting with the trend toward privatization), but some local governments have pooled their resources and achieved similar savings by creating regional authorities to own and operate waste facilities (Goldberg & McCarthy, 1993; DCA, 1997).

These shifts meant that Georgia's state and local governments generally were not as anxious about solid waste management as they had been in the 1990s, allowing another new trend to emerge with some stealth: growth in per-capita trash disposal (DCA, 1997). This trend was fed largely by an influx of out-of-state waste imported to Georgia for landfilling, which in turn was encouraged by Georgia's low tipping fees relative to those of neighboring states (DCA, 1997). The state's annual solid waste reports expressed some concern about this steadily rising trend in per-capita solid waste disposal and cautioned that the growth in out-of-state trash should be monitored (DCA, 1997).

Few substantive developments in market development

The CSWMA's approach to markets for recycled products was its provision creating the Georgia Recycling Market Development Council. Hugh Esco's op-ed about the new law criticized this mechanism as weak—and indeed today there appears to be little in the public record of the council's accomplishments.

Georgia has made other attempts at market development. The state's FY 1996 Solid Waste Annual Report listed among the efforts for that year, "support recycling market development by encouraging businesses and government agencies to purchase products made from recycled materials" (p. 24). To that end, the state, in partnership with EPA Region IV and U.S. Conference of Mayors, hosted one of four "buy recycled" conferences where speakers from industry and government discussed the availability and procurement of recycled products (DCA, 1997). Georgia's Department of Community Affairs then published its first "Buy Recycled ... Buy Georgia" guide of 83 manufacturers and distributors of recycled products in the state (DCA, 1997).

Georgia is part of a regional effort to develop markets for recycled products, the Southeast Recycling Development Council (SERDC), which covers eleven states in the U.S. Southeast. SERDC, a 501(c)3 sponsored by recycling companies and end-users of recycled materials including Alcoa, Coca-Cola, and Pepsico, states on its homepage that its mission is to "unite industry, government and non-government organizations to promote sustainable recycling in the Southeast" (SERDC, n.d.a). SERDC's activities focus mainly on encouraging and educating local government to increase recycling participation at the community level.

5.2. The emergence of the Zero Waste Zones in Atlanta

By the mid-2000s, the unbalanced nature of government efforts to reduce waste disposal (focusing almost exclusively on households with little attention to commercial and industrial generators), underdeveloped infrastructure and markets for recyclable materials, and waning public interest in solid waste issues in general left a vacuum in Georgia to be filled with more targeted initiatives of the private and nonprofit sectors—including Atlanta’s Zero Waste Zones.

5.2.1. Atlanta loses a convention and gains a waste-reduction advocate

Media stories on Atlanta’s Zero Waste Zones (ZWZ) often recount the 2008 incident in which a group searching for a convention venue rejected Atlanta because it perceived the city as not concerned enough with sustainability, and chose Orlando, Florida, instead. This is the story that Holly Elmore, founder of the ZWZs, likes to tell. As Elmore wrote in her Zero Waste Zones blog, “Atlanta is a convention-driven city and I decided to make this decision my first best friend. Now when speaking to Atlanta foodservice operators I could explain going green goes beyond ROI (return on investment) to the Big R (revenue)” (2009a).

This event’s significance to the city’s hospitality industry and economy should be given some context. As an employee of the Georgia World Congress Center explained, the group in question was relatively small (it needed only a hotel and not a major convention center), and sustainability has not been a deal breaker for the vast majority of groups seeking convention locations (T. T. interview). But this incident is important to Atlanta’s ZWZ story in that it gave Elmore the motivation to pursue sustainable change in her city, starting with an industry that she already knew well.

Holly Elmore’s career started in financial services in the 1980s, first in audit at Arthur Andersen and later at Trammel Crowe where she was comptroller for the company’s southeastern division. After a layoff late in the decade she started her own catering business. She served on the Atlanta Restaurant Council board and worked with the Georgia Restaurant Association (GRA) as an official liaison between the GRA and restaurant chefs. Elmore counts her experience working in the foodservice industry as key to her later ZWZ development work, noting that it gave her credibility with the kitchen staff at hotels and restaurants and allowed her to “speak their language” (H. E. interview).

While with the GRA, Elmore started the Local Sustainable and Green Roundtable for chefs interested in environmentally-responsible food production. At the first meeting, in 2007, thirty chefs showed up. The second roundtable meeting, in January of 2008, attracted around a hundred attendees with more diverse affiliations including the Centers for Disease Control, Emory University, the City of Atlanta, and the office of the Commissioner of Agriculture. The surprising turnout and interest led Elmore to establish an organization called the Green Foodservice Alliance.

Later in 2008, after Atlanta lost the convention, Holly Elmore was in a meeting at the Coca-Cola offices when a member of the management suggested creating a “Zero Waste Zone” in the downtown Atlanta area to encompass all the big convention players and encourage more sustainability in their operations by reducing waste, particularly food waste (H. E. interview). As Elmore recalled, at the time no one was

doing anything like this in the country; there was curbside organics collection in some communities out west, and perhaps some food waste recovery at food processing plants, but nothing on a large scale within the foodservice industry.

Atlanta, like most other local governments across the country, did not mandate recycling in its commercial sector. Accordingly, recycling rates have been low among the region's businesses and institutions (DCA, 2005). Haulers and processing centers did exist to handle typical recoverable materials like paper, glass, and plastic, but there was nothing comparable for organics collection.

5.2.2. Why "zones"

The concept of geographically-bounded areas, or zones, was central to the development of at least the first ZWZs. Holly Elmore gave two reasons for this. First, it is easier to get a large number of businesses and institutions to participate if they share proximity to one another, because often they are already members of a spatially-defined business association. For example, downtown Atlanta has Central Atlanta Progress, midtown has the Midtown Alliance, and in the area of the city known as Buckhead there is the Buckhead Coalition. Getting the business association interested and involved allowed the ZWZ leadership to transfer some of the responsibility for outreach and education to the association and make use of its built-in communication network with its membership. Second, multiple participants close together in space creates route density. As Elmore explained with the example of an organics collection program, having participating customers clustered in a zone can bring down the food waste hauler's transportation costs along its collection route and possibly reduces the price charged to the customer as well.

The initial goal was to establish several zones around the city, and the first to be developed was one in downtown. Holly Elmore assembled a group of multi-level governmental and nonprofit partners to help her plan ZWZ-Downtown Atlanta, including the U.S. EPA Region IV office, the Sustainability Division of the Georgia Department of Natural Resources, the Georgia Recycling Coalition, and Atlanta Recycles (Elmore, 2009f).

5.2.3. Selecting criteria

An important task of the partners was selecting a set of criteria that would qualify businesses and institutions as official participants in the ZWZ. This happened when Holly Elmore and Roy Edwards of the Georgia Department of Natural Resources' Sustainability Division found themselves with some time on their hands at a 2008 conference of the Georgia Recycling Coalition (GRC). The two came up with three criteria: food waste diversion, recycling of spent kitchen grease into biofuel, and common recycling of paper and containers (H. E. interview).

Elmore explained the foundations that underlie these criteria. First, food safety is critical; diverting food from the waste stream can take several forms, including saving it for food banks or other charities, following guidelines of the Good Samaritan Food Donation Act of 1996. Second, all waste diversion measures must make good business sense in that they should be either cost-saving or cost-neutral, revenue-generating or revenue-retaining. Third, participation must have a positive impact on employee

morale. Fourth, zero waste efforts should benefit the community, whether environmentally or economically (H. E. interview).

5.3. A missing but critical piece: commercial food-waste composting

One of the three criteria for participation in a zero waste zone was food waste diversion—but not all unconsumed food was appropriate for charitable donation. The zones' targeted hospitality and foodservice industries produce high volumes of pre- and post-consumer food scraps and needed access to a commercial composting operation accepting food waste. But early in the ZWZ timeline no such business existed in the state of Georgia⁶ although the state had acknowledged the unmet need.

In November of 2006, a year after Georgia's statewide waste characterization study was released showing that food waste was the largest category of landfilled material and that 48 percent of it came from the Atlanta region, the Georgia EPD held a stakeholder meeting to discuss the problem (Olivares & Goldstein, 2008). Participants identified barriers to food waste diversion, ideas on how to overcome them, and potential projects. Two years later EPD, along with the Georgia Recycling Coalition, the Coca-Cola Company, and US EPA Region IV, held a follow-up workshop, "From the Table to the Farm: Options for Diverting Food from Landfills" (Olivares & Goldstein, 2008, p. 29). The purpose was to explore alternatives "including source reduction, procurement changes, food rescue/donation and composting" (p. 29). More than 60 attendees represented government agencies, businesses, nonprofits, farms, and schools.

There is no indication that these early state efforts directly resulted in substantive change. But while Elmore was planning the ZWZs in 2008, she found out that a couple in the Atlanta metro area were, coincidentally, 18 months deep in the process of obtaining a permit for exactly the kind of food waste composting operation her participants needed. The Green Foodservice Alliance arranged a meeting at the state Department of Agriculture, led by the EPA Region IV's RCRA division chief and attended by representatives of state agencies and nonprofits concerned with composting. According to Elmore, that meeting helped to accelerate the permitting process for the state's first commercial food waste composting operation, and within a matter of weeks the couple—founders of Greenco Environmental—had their permit.

5.3.1. A first for Georgia: Greenco Environmental, LLC

Tim and Melia Lesko had started researching the business of composting in 2006 although not as a result of the state's own exploratory efforts in that area. Tim Lesko, a former medical software entrepreneur, was seeking an opportunity to work for himself again and initially considered starting a landscaping company in Atlanta. As Mr. Lesko researched landscape companies to buy he realized they shared a big problem: what to do with the yard waste they generate in the course of their work. A mid-size landscape

⁶ At the time Georgia did have some private and institutional food waste generators (for example, some prisons) that were allowed to compost on site if they used just their own organic waste as the input and used the resulting product themselves. But no commercial composting operations existed that accepted food waste generated off-site (Governo et al., 2002).

company—one of about a hundred in Atlanta—spent \$150,000 a year to have yard waste hauled away (Farrell Tucker, 2010).

Georgia's ban on yard waste in most MSW landfills had taken effect in 1996, reducing the number of destinations accepting this material. As Melia Lesko, Greenco's Vice President, recalled, landscapers staying close to the city could pay fees of \$50-\$60 a ton to legally dump yard waste at an inert landfill, and hauling it themselves could be inconvenient and time consuming. Some landscapers had their own property where they could pile yard waste and allow it to break down into carbon based mulch, but that generally takes a very long time. In his research Tim Lesko learned of a way to speed up this process using a balance of different types of organic materials and active aeration to achieve the high temperature that differentiates composting from mulching. When he discovered that no one else in the state was composting food waste, he decided to start a business collecting both yard and food waste and turning it into a valuable fertilizer for use in landscaping.

Starting the composting business proved to be a much greater investment in time, effort, and money than the Leskos had anticipated. Much of the difficulty stemmed from the fact that, as the first commercial food waste composting operation in Georgia, they were in uncharted territory. Before it could obtain a permit from the state Environmental Protection Division for the proposed facility, Greenco needed to submit documentation from the locality where it planned to build, including a letter of zoning describing allowed land uses of the proposed site and a letter of consistency confirming that the company met the standards of the local solid waste management plan (Farrell Tucker, 2010). Tim Lesko approached several counties but they all decided that since he would be composting food scraps and not just yard waste, his facility should be treated like an MSW landfill (Farrell Tucker, 2010).

County regulations required that operations classified as landfills locate on land zoned for heavy industrial activity (Farrell Tucker, 2010). Such land is scarcer and much more expensive than land zoned for agricultural use. This narrowed location options for Greenco, which originally sought 50 acres on agricultural land. But trying to obtain changes in the zoning of an otherwise suitable parcel would have delayed operation by about a year, "so we were looking to work within the confines of the rules as they were already in place," says Melia Lesko. This meant that Greenco had to locate farther from Atlanta's city center than desirable and on fewer acres than it wanted, in Barnesville, about 50 miles south in Lamar County.

Greenco started composting food waste in the fall of 2008. Mrs. Lesko said that the distance challenge forced Greenco to be more creative and come up with efficiencies in equipment (such as lighter, customized trucks) and routing. In 2010 Greenco processed feedstock from 40 generator-customers including supermarkets, restaurants, landscapers, schools, hospitals, and municipalities (Farrell Tucker, 2010). With tipping fees in the Atlanta region around \$33-\$45 per ton, Greenco was able to offer a slightly lower rate at about \$30 per ton, which provides enough incentive for customers to separate out their food waste for collection (Farrell Tucker, 2010).

5.3.2. A storm—and then a storm of complaints

Nearly a year after opening for business the Leskos faced a serious test brought on by bad weather. In September of 2009, severe storms in the Atlanta area dropped 20 inches of rain in about three days. Greenco's neighborhood flooded but it took the company some time to realize what was happening at its facility. The compost piles became so saturated with water that they turned anaerobic, lacking the oxygen necessary for proper composting. The piles needed more carbon based (woody) material to absorb that water and, as Melia Lesko puts it, "kick-start Mother Nature again into an aerobic process—and we figured it out too late." Realizing the existence of a problem was just a start; it also takes a long time to apply the remedy to 30 acres of anaerobic compost piles. Greenco ended up needing five or six months to fix the problem, but, Lesko recalls, "by then the damage was done."

Anaerobic decomposition is very different from aerobic, involving release of methane and an unpleasant smell. After an issue-free first year of operation, the flooding event triggered complaints from surrounding residents about noxious odors drifting from the facility. In February of 2010 a magistrate court hearing ruled that the odors constituted a nuisance and ordered Greenco to pay a fine and resolve the problem within 30 days (Geiger, 2010a). Greenco appealed the decision to superior court, and in May the resulting consent agreement between the composting business and Lamar County gave Greenco up to 150 days to implement operational changes including purchase of a new \$450,000 windrow tuner, a machine for aerating compost piles (Geiger, 2010b). Despite Greenco's compliance with the order the complaints continued, so in November the superior court judge ordered the company to move its operations out of Lamar County within 12 months (Geiger, 2010c).

At least in late 2011, Greenco was planning to move to a new site to the east of Atlanta in DeKalb County, a spent tract in the middle of an active rock quarry where the possibility of NIMBY problems is remote.⁷ Melia Lesko said that, nuisance issues aside, Greenco already had been considering a move for business reasons because the composting operation needed more space. An early plan was to have two separate facilities on opposite sides of metro Atlanta, but Greenco ultimately decided that it could not justify two sets of very expensive capital equipment and two sets of employees. The Leskos settled on a larger site that will allow for a greater volume of compost production with their other existing assets (M. L. interview).

5.3.3. Supply challenges from growth and changes in state landfill policy

Greenco's increase in foodservice customers (including those trying to meet the ZWZ criteria) introduced an unexpected problem: not enough woody, carbon-based material to mix with burgeoning amounts of food waste. Proper composting requires a recipe. Greenco measured the density of the food waste it collected and adjusted the amount and type of woody matter added to it to achieve a proper ratio of carbon to nitrogen. The quality and necessary processing of this material can vary depending on the season (e.g., more leaves available in the fall) and source (e.g., lumber mill vs. landscaper). When Greenco selected its Barnesville site near a lumber mill, the Leskos thought that the mill might offer synergies with their operation by supplying wood waste, but the mill has its own long-term contracts for

⁷ The author was unable to reach Greenco to verify if the company moved to a new location.

that waste so Greenco was not able to use it as a steady source (M. L. interview). Greenco relied mostly on yard waste and was able to stockpile it early on, but the company later had difficulty securing a consistent supply of that carbon-rich feedstock as much of the yard waste in the area is now going to power generators (Farrell Tucker, 2010). Thus Greenco turned to yard waste collected by county governments.

A potential challenge that is still too new to be fully assessed is the recent repeal of Georgia's ban on yard waste in landfills. Georgia, like many other states, imposed a legislative ban on yard waste in most of its MSW landfills following concerns about a landfill space shortage. But in the past few years the country has seen efforts to repeal those yard waste bans in several states including Missouri, Michigan, Florida, and Georgia (Sullivan, 2010a).

The reasons for these repeal efforts vary depending on the source consulted. The major argument made by landfill owners in favor of lifting the ban was that yard waste helps a landfill generate greater quantities of methane—which can be collected for alternative energy production (Badertscher, 2010). But the timing of the repeal efforts suggests other possible motives. The United States Composting Council pointed out that landfill revenue has declined due to increased environmental awareness and the economic downturn (“Landfill Yard Trimmings,” 2011). Consumption falls during a recession with a corresponding decrease in waste disposal, so landfills take in less waste and earn less revenue. Releasing landfills to once again accept yard waste would allow the owners to improve earnings through increased volume without the need to raise tipping fees. This would benefit not only rising number of corporate owners but also the few remaining local governments that own landfills, many of which were cash strapped by the recession.

Georgia's ban on yard waste in landfills survived an attempted repeal in 2010 but succumbed in 2011. Reflecting concern that organic material in landfills can contribute to climate change, the ban repeal as ultimately passed allows yard waste in only those landfills that have an active landfill gas (LFG) capture system in place (Badertscher, 2010). There are 10 such landfills in the state that, in 2007, took in 43 percent of Georgia's landfill waste and already had spent millions of dollars on technology to collect LFG (Badertscher, 2010). LFG is a mixture of mostly carbon dioxide and methane generated under the low-oxygen conditions typical of a landfill (U. S. EPA, 2013). Methane is a particularly potent greenhouse gas, as explained in the background of this thesis, 21 times more effective than carbon dioxide at trapping atmospheric heat over a 100 year period (U.S. EPA, 2013).

Greenco's Tim Lesko testified in state hearings against the repeal, his major argument focusing on LFG capture systems' failure to collect all LFG generated (M. L. interview). Scientific findings and practitioner opinion do support this position. Barlaz, Chanton, and Green (2009) reported that landfill methane efficiency, which is “the amount of landfill gas that is collected relative to the amount generated in the landfill,” varies “between 50% and near 100% dependent on the type and extent of LFG collection system coverage” (p. 1404). The EPA's *AP-42 Emissions Factors for Municipal Solid Waste Landfills* (1998) acknowledged a range of reported collection efficiencies from “60 to 85 percent, with an average of 75% most commonly assumed” (p. 2.4-6). In contrast to landfilling, the process of composting

generates little or no methane—when it is performed correctly with sufficient oxygen and nutrient balance (US Composting Council, n.d.).

It is important to note that Georgia’s legislative repeal allows local governments to decide for themselves whether to lift or keep the ban in their own jurisdictions (M. L. interview). Thus the repeal does not necessarily mean that all 10 qualified landfills in the state will now accept yard waste—or that every yard waste generator will use landfills for disposal if given the option. Atlanta’s city government—which has voiced the goal of rising in the ranks of sustainable cities—signaled that it will not send municipally collected yard waste to landfills (M. L. interview). The ultimate effects of the yard waste ban on composting in Georgia may depend on local governments’ perceptions of what the most environmentally sound choice is and their calculations of how that choice can affect them financially and politically.

5.4. Recruiting participants

Success of the ZWZs would depend on as widespread participation as possible, and for that Holly Elmore needed to start with motivated founding participants. This recruitment process is where Elmore said her business experience paid off and her affiliation with the Georgia Restaurant Association was an asset. Elmore contacted foodservice and hospitality establishments in Atlanta’s downtown to arrange meetings with decision-makers including CEOs, presidents, and general managers. She recalled that she received a one-hundred percent “yes” response rate—at least to setting up meetings. The ZWZ-Downtown Atlanta would eventually sign up thirteen participants.

5.4.1. *The Hyatt Regency Atlanta*

One hotel, the Hyatt Regency Atlanta, learned about the ZWZ effort when its general manager attended a meeting of the Georgia Hospitality and Lodging Association where Holly Elmore introduced the emerging concept of the zones. Randy Childers, the hotel’s Senior Director of Engineering, was the first prospective participant to contact Elmore directly without waiting for a recruitment call. Childers assumed responsibility for the Hyatt’s participation in the first Zero Waste Zone and his enthusiasm for the effort led him to serve in the leadership position of “Champion” for ZWZ-Downtown Atlanta.

As Childers recalled, the Hyatt Regency Atlanta had already been recycling common recyclables and used cooking oil. But the criteria for ZWZ participation and contacts that Elmore provided prompted the hotel’s switch to haulers and processors who ensured that the waste grease was used specifically for biofuel production and motivated the Atlanta Hyatt to compost its food waste, through Greenco. The hotel also started recycling glass again, which it had stopped doing for a while. In 2009, the Hyatt Regency Atlanta’s glass recycling effort earned it the “Friend of Glass” award from the Glass Packaging Institute (Giacoppo, 2009).

The Hyatt Regency Atlanta became the first ZWZ-Downtown Atlanta business to comply with all three ZWZ criteria. Childers said that the major challenge was convincing his colleagues that the hotel’s expanded materials collection would not present an undue burden or odor problems. But he reported

that separating out food waste for pick up every other day has been easy for the staff and in fact leaves the dock area cleaner than it used to be. There are also fewer odor problems since food waste is no longer dumped into the trash compactor where it produced a smelly liquid that would often leak, requiring staff to scrub down and sanitize the area every time the compactor was pulled for emptying.

Participation in the ZWZ was not this Hyatt's first environmental initiative. Jimmy Chancellor, the Atlanta hotel's Executive Steward, pointed to Childers's leadership and even further back, noting that this particular hotel "has been thinking green for a long time" and is more environmentally accomplished than many of the Hyatt's other properties. Over the past decade the Hyatt Regency Atlanta has reduced energy consumption by 37 percent and water consumption by 38 percent from 2000 levels through a variety of measures, such as upgrading to more energy efficient mechanical systems and lighting, installing water-saving plumbing fixtures, and landscaping for drought tolerance to reduce the need for irrigation (R. Childers, personal communication, June 17, 2009). The hotel's sustainability efforts, including its ZWZ leadership, earned it the 2009 Good Earthkeeping award for large hotels from the Georgia Hotel and Lodging Association (R. Childers, personal communication, c. 2009).

The hotel's environmental activities are largely independent but it has received encouragement from corporate headquarters. Hyatt Hotels & Resorts started developing a corporate-wide environmental policy and green educational programs for its employees in 2007, at a time when that was still somewhat rare for a hotel company (Hasek, 2008). Hyatt adopted corporate-wide goals of reducing energy consumption per square meter by 25 percent, water consumption per guest night by 20 percent, and greenhouse gas emissions per square meter by 25 percent—all by 2015, with 2006 as the baseline year ("Goals and Progress," n.d.). The company's newest goal is reducing waste sent to landfills per guest night by 25 percent, with 2010 as the baseline ("Goals and Progress," n.d.). But differences among property locations that seem beyond the Hyatt's control can complicate corporate attempts to meet these goals. In 2008 Brigitta Witt, at the time Hyatt's Vice President for Environmental Affairs, argued, "the reality is that a lot of the markets we are in don't always support the best way to do things. Sustainable waste management is one example. It won't succeed without a municipal system to support it" (Hasek, 2008).

Randy Childers recalled that he was recycling food waste as early as 1991 when he worked at another Hyatt property, in Minneapolis. The hotel sent all its food waste to a farming operation where it was sanitized and processed for hog feed. But, as Childers explained, some other important factors gave rise to the Hyatt's practice of food scrap recycling in Minneapolis:

Minnesota's a very progressive state and they were, from a regulation standpoint, very instrumental in making the decision to recycle very economically beneficial. In 1991, to haul one compactor load of waste out of a hotel would cost about \$1200. That same compactor load here [in Atlanta], today, 20 years later, costs about \$300-400. Kind of in a similar time, to haul it in Minneapolis was \$1200, and here [in Atlanta] it was probably \$200 or less. So what's the difference? The differences are the governmental taxes, if you will, or tariffs on sending waste to landfill. In Minneapolis, they had a trash burner power plant in downtown Minneapolis, and a lot of those fees went to support that, so it was very expensive to throw something away For

our food waste that I was talking about, we were paying a fair amount of money to that farming operation. We had to pay them, but the cost was less than throwing it away. So there was a punitive incentive to do the right thing. You weren't penalized for not recycling, but you were penalized for throwing it away by high tariffs on the cost of sending waste to the landfill. So it made it harder for us to adopt, to make the economics work here [in Atlanta]. (R. C. interview)

Childers noted that in some cases it is still cheaper to throw things away in Atlanta, but it is changing. "We break even or a little bit better through our recycling efforts," he said. Jimmy Chancellor reported that the hotel used to give away its cardboard but now a business is willing to pay for it by the pound. He also reported that prices for certain recyclable commodities have risen in recent years (paper, for example). Said Chancellor, "The fact that it's making economic sense I think is one of the driving factors here."

5.4.2. The Georgia World Congress Center Authority

The Georgia World Congress Center was one of the first participants to sign up with the ZWZ-Downtown Atlanta in 2009, and, as it is the country's fourth largest convention facility, proved a major addition to the ZWZ effort. The center is owned and operated by a state authority whose campus includes the Georgia Dome (where the Atlanta Falcons play) and Centennial Olympic Park—both of which also became ZWZ participants and pledged to meet the zone's criteria.

In December of 2010 the Georgia World Congress Center Authority (GWCCA) hired its first sustainability coordinator of facilities, Tim Trefzer ("Georgia World," 2010). According to Trefzer, the authority recognized a growing trend in convention-space seekers interested in sustainability—but the authority's environmental initiatives always had been secondary priorities and the staff lacked the expertise to guide them. A few other convention centers around the country had sustainability coordinators on staff so the GWCCA decided it was time to adopt such a position itself.

Asked to assess the green trend in conventions, Trefzer said that most convention-space seekers are not requiring specific environmental practices. Rather:

They just want to know that they are doing something ... but they don't necessarily make or break a deal. There are certain conventions, though, that are extremely interested, and it's a minimal percentage of the overall business, but there are certain ones that are really pushing the envelope ... and just for those conventions alone it's really important for us to be on our game.

Joining the ZWZ-Downtown Atlanta gave the GWCCA impetus to strengthen its weak recycling program, start composting food waste, and send its used fryer oil out for recycling into biodiesel (T. T. interview). According to Tim Trefzer, composting has had the greatest impact so far, as food waste represents about 50 percent of the facilities' recoverable material. Composting not only food but also biodegradable dinnerware (such as plates and utensils) has required that GWCCA's caterer, Levy Restaurants, educate its staff and kitchen employees on proper material separation during clean up. Trefzer had to create signs and walk around to the different recycling stations after events to make sure

the crew was following the new rules (for example, disposable straws go in the trash while disposable but biodegradable forks go in the composting bin). He noted, “That was really challenging but it was really exciting to see the result.”

When the GWCCA became a participant in the ZWZ it did not have a specific goal for its own waste diversion (ZWZ participation did not require diversion percentage goals, just adoption of the three criteria). Tim Trefzer decided that effective diversion would require a goal so he made developing one a priority when he started working at the GWCCA. But he also recognized that first “we’ve got to be able to measure where we currently are in order to improve.” Trefzer said that it took about eight months to determine with some accuracy the amounts and types of trash generated at the GWCCA’s three massive properties. They share certain waste streams so trying to divide them for each facility was a challenge. Now the GWCCA tracks its waste diversion on a monthly basis. Its fiscal year 2012 goal for one of the facilities, the World Congress Center, is diversion of 35 percent of its waste from landfills. Trefzer said that the GWCCA is also hoping to pursue Leadership in Energy and Environmental Design (LEED) certification for existing buildings. One way to earn points toward that certification is by achieving 50 percent waste diversion, so that could be GWCCA’s official goal in a few years.

Tim Trefzer acknowledged the high level of effort and cooperation—perhaps some even beyond his control—required to meet his facilities’ diversion goals:

One of the biggest challenges for us is just the sheer number of visitors that we have on our campus and trying to get them to contribute and help us. I can do as much internal training with our staff as I can do, but when you’ve got 70,000 people for an afternoon at the Georgia Dome drinking beer and watching a Falcon football game, they don’t know necessarily what’s recyclable, they don’t know necessarily that we even recycle, so it’s kind of that type of education to get them to participate that has been a challenge.

The Georgia Dome partnered with Coca Cola Recycles, which furnished the facility with several hundred recycling containers that can be placed outside for tailgating as well as inside the building. But the receptacle shapes suggest that they only accept bottles and cans, when the facility actually has single-stream recycling that allows it to accept cardboard and paper in addition to (and commingled with) beverage containers. This can confuse visitors at the Georgia Dome and requires extra education.

There are of course costs and potential savings associated with the GWCCA’s zero waste effort, but the GWCCA has not tracked these closely. According to Trefzer, “I don’t think anyone has done any of the number crunching to see if we’re actually saving money from composting versus just throwing it in the trash, but eventually I think it is just a wash.” He noted that many convention centers do not compost, and the fact that the GWCC does “is a huge advantage for us, and I know a lot of conventions see that as a positive attribute.”

5.5. An approach highly dependent on peer education and support

ZWZ participants relied to a great extent on one another's experience and expertise to plan and implement their waste reduction efforts. Holly Elmore built this peer education into the ZWZs by creating leadership positions for enthusiastic, knowledgeable participants: Zone Champions and Ambassadors.

The Hyatt's Randy Childers, Zone Champion for ZWZ-Downtown Atlanta, took on a particularly active role in assisting new ZWZ recruits. He explained how ZWZ peer education works:

One of the things we've done to help the effort is we do a lot of site visits for the ZWZ where people come in and they're full of apprehension about the project, the prospect of putting this system in place in their facility. I'll give an example: we did a site visit with Emory University, [which] is very progressive in their sustainability programs, but they were fearful about adopting the food waste-to-composting element. And we walked them through and were able to reassure them that it was going to work well for them and it addressed their concern, to see us doing it without the issues that they concerned about, and they were able to comfortably convince everyone to adopt it and do likewise. We've also done this for the Westin, several country clubs and various other facilities that have come through and satisfied their reservations about adopting the practice.

But this peer support role can be taxing. Steve Simon of Fifth Group Restaurants explained: "as a business owner, as much as my heart is in this, I get conflicted [about] spending 15 or 20 percent of my week on issues like this [in addition to] my other 60-hour-a-week job."

Dan Hourigan, Director of Transportation and Sustainability for the Midtown Alliance—a membership-based business improvement district in Atlanta—considered his main ZWZ-related difficulty to be a lack of "resources to allocate staff to do some of the outreach." He found that restaurants require a great deal of handholding and education because each has a different set of issues to overcome to meet all of the ZWZ criteria, "so it's not a kind of one-size-fits-all program." Allocating resources for ZWZ outreach is a challenge for the Midtown Alliance as a nonprofit that is currently in the process of setting priorities for sustainability programming (D. H. interview).

5.6. Growing media recognition and new zones

5.6.1. ZWZs in the public eye

On February 10, 2009, ZWZ leadership held a press conference at the Georgia World Conference Center to introduce the first zone, ZWZ-Downtown Atlanta (Elmore, 2009b). Holly Elmore had met with and received the support of a representative of the Atlanta Convention and Visitors Bureau who mobilized his public relations connections in the industry, calling in a favor due him, so that the press conference could be done pro-bono. Sharon Goldmacher of communications 21 provided the public relations services and also suggested that Elmore start a blog for the Zero Waste Zones. Goldmacher would later handle a second ZWZ press conference at no charge (Elmore, 2009b).

Speakers at the press conference included prominent figures from government and nonprofits: Stan Meiburg, Acting Regional Administrator for EPA's Region IV; Lynette Young, then Executive Director of Sustainable Atlanta; Laura Turner Seydel, ZWZ Honorary Chairperson and sustainability education advocate (and daughter of media mogul Ted Turner); and Kevin Duvall, Assistant General Manager of the GWCC (Elmore, 2009b).

According to Holly Elmore, the press conference garnered 60 million media impressions (the estimated number of media consumers reached) for the ZWZ effort. It led to a story that ran on CNN.com's homepage the weekend before Earth Week 2009 and a video that aired during prime time in domestic and international markets (Levin, 2009). Later that summer Earth911.com, a major resource for consumer recycling information and news, posted an article on local zero waste efforts titled "Cities of Change" that reported on Atlanta's first ZWZ along with activities in San Francisco, Portland, Seattle, and Austin (Wills, 2009). And in the fall of that year *The New York Times* ran a front-page article on zero waste that featured one of Atlanta's ZWZ participants (Kaufman, 2009).

Atlanta's Zero Waste Zones also received recognition from the federal government. On June 11, 2009, Mary Beth Van Pelt of EPA Region IV accepted an award on behalf of the ZWZ-Downtown Atlanta team from the EPA's national Office of Solid Waste and Emergency Response (OSWER) (Elmore, 2009f). It was the Strengthening OSWER Partnerships Award.

Holly Elmore said that within months of this heightened attention she stopped making an effort to recruit for the ZWZs, since people were approaching her to find out how they could get involved.

5.6.2. ZWZ-Buckhead

David Rossman, General Manager with the Buckhead Doubletree hotel, was one of them. Holly Elmore described him as a "pioneer" for initiating the next ZWZ, in the upscale Buckhead business and residential district in northern Atlanta. Rossman had been serving as a member of the working group of the Sustainability Division of the Georgia Department of Natural Resources (DNR) when the DNR referred him to Elmore in February of 2009 regarding participation in a Zero Waste Zone (H. E. interview). Rossman became the official Zone Champion for the Buckhead ZWZ, a leadership position he held until transferring to Tampa, Florida, in late 2010 where he continued his zero waste advocacy in his new position with the Sheraton Suites Tampa Airport (Elmore, 2011f).

In May of 2009 the Buckhead Coalition and Buckhead Life Group officially launched Zero Waste Zone-Buckhead by sponsoring a participant recruitment meeting, with more than 60 restaurateurs and hoteliers from the business district attending (Elmore, 2009e). Eleven Charter Participants eventually would join, including nine restaurants and one private K-12 school in addition to Dave Rossman's hotel (Elemental Impact, n.d.d).

Garth Peters, the Buckhead Coalition's Director of Community Development, took on personal responsibility for recruiting future participants for the Buckhead ZWZ. He served as a member of the Safety Committee of Neighborhood Planning Unit B which is responsible for approving alcoholic beverage license applications (North, 2010). Peters decided that at least he, if not also other committee

members, would ask all liquor license applicants if they planned to participate in the Buckhead ZWZ and would be ready to educate them about zero waste and encourage them to voluntarily adopt the zone's three-part recycling practices (North, 2010).

Buckhead Doubletree Hotel

David Rossman had already made his hotel compliant with the ZWZ criteria by the time the Buckhead ZWZ was announced (Elmore, 2009c). A year later the Doubletree had increased its recycling and reduced its waste to the point where it was able to convert the hotel's 30 cubic yard trash compactor to a recycling compactor and use its old two-yard recycling receptacle for trash collection instead (Elmore, 2009d). The hotel's per-occupied-room trash generation dropped from 6.0 lbs in 2007 to 3.3 lbs in 2009 (Elmore, 2009d). Rossman estimated that his hotel's waste reduction efforts saved between \$2,000 and \$3,000 annually (Braddick, 2009). The Doubletree also was the first ZWZ participant to "close the loop" by creating an on-site chef's garden (with help from the University of Georgia Cooperative Extension Office for Urban Gardening) using finished compost from Greenco Environmental, where the Doubletree's food scraps are hauled (Elmore, 2009h).

5.6.3. ZWZ-Caterers

Unlike the first two zones, the next to form in 2009 was not spatially defined by a business district but rather by type of foodservice operation: catering. ZWZ-Caterers would eventually sign on seven participants, all caterers within the Atlanta metro area (Elemental Impact, n.d.e).

Affairs To Remember Caterers

Catering company Affairs To Remember, run by Patrick Cuccaro, became the first participant in the new zone and met the ZWZ criteria within a few weeks of making the pledge (Elmore, 2009i).

Affairs To Remember issued a press release in August of 2009 announcing its "divorce" from landfills and detailing its waste reduction accomplishments, including preventing 14,238 pounds of recoverable materials from reaching landfills in a month for a diversion rate of 83 percent (Affairs to Remember Caterers, 2009). In addition to recycling common recyclables, composting food waste, and sending spent grease to biofuel production, the company donates unused prepared food to the charity Atlanta's Table (Affairs to Remember Caterers, 2009). According to Patrick Cuccaro's testimonial on the Elemental Impact website, zero waste practices have also proved financially beneficial, helping to attract clients prioritizing sustainability:

The ZWZ program is a financial winner for our company. It differentiates us, and in the realm of luxury catering where exciting food is increasingly a commodity, differentiation is what it's about. We have already experienced well over \$165,000 in sales made almost exclusively because we are a responsible caterer who "walks the talk" of sustainable practices. (Cuccaro, n.d.)

5.6.4. ZWZ-Midtown

The next Zero Waste Zone to formally launch late in the fall of 2009 was place-based, in Atlanta's Midtown business district. The Midtown Alliance, the district's business coalition, had contacted the Green Foodservice Alliance about establishing a new zone in the area (Elmore, 2009g).

Fifth Group Restaurants

One of Midtown's most prominent restaurants, Ecco, is part of the Fifth Group collection of six fine dining restaurants in the Atlanta metro area. Holly Elmore approached Steve Simon, owner and partner of Fifth Group Restaurants, and asked him if he had any interest in pursuing zero waste. Simon recalled telling her that Fifth Group was not doing much in the way of waste reduction at the time, but her response was along the lines of, "perfect ... there's only one way to go and that's up." He joined the GFA right away as a board member and attended the GFA's meetings with vendors offering sustainable solutions to restaurateurs and caterers. Simon became the ZWZ-Midtown Champion and an active spokesperson for the Zero Waste Zones in general. It was Simon's waste reduction success at Ecco that would be highlighted in the *New York Times* story on zero waste in October of 2009 (Kaufman, 2009).

Shortly after joining the Green Foodservice Alliance, Ecco test-piloted an improved recycling program for eventual adoption at the other Fifth Group restaurants. Ecco soon found that it could divert so much of its waste stream through composting and recycling (including spent fryer grease-to-biodiesel) that it canceled its trash pick-up service, earning the distinction of Atlanta's first Dumpster-free restaurant. The chef kept a trash bag on hand to collect Ecco's small amount of non-recyclable waste and would take it home or to one of the group's other restaurants for disposal.

According to Steve Simon, Fifth Group now diverts between 7,000 and 11,000 pounds of food waste from each restaurant every month for composting. He said that recycled material has a greater volume and less weight than the organics but he does not keep track of the exact amounts. Only one Fifth Group restaurant lacks comprehensive recycling because there are no haulers willing to travel the distance to its relatively remote location northwest of Atlanta in Smyrna (S. S. interview).

Simon recalled that Fifth Group was able to make all its waste reduction changes relatively quickly and that the biggest challenge was getting out of existing trash contracts and selecting new haulers for the restaurants' diverted materials. In some cases Fifth Group would wait until a contract expired and in others the waste hauler also provided recyclable hauling service and agreed to cancel the trash contract if Fifth Group used them for recycling pick-up. Simon noted that since then many waste haulers have changed their business models to include recyclables.

Simon said that his restaurants' zero waste efforts have been neutral, from a cost standpoint; "We might have saved a little money in a couple locations and probably spent a little money in a couple locations." And with regard to internal operations, "the impact has been pretty small" even though separating waste into different streams naturally takes up more space, requiring more bins inside the restaurant as well as outside for storage. According to Simon:

We've got a staff both managerial and hourly that's been very into sustainability, and so they've been pleased to get on board. It's a very small percentage of the staff that's less engaged, but the group dynamic works so that the program works. Quite honestly I anticipated much more pushback from the staff as far as changing their habits. I was pleasantly surprised there.

Asked if zero waste is important to Fifth Group clients, Steve Simon said that it is to a certain segment; the staff talks about it with guests when appropriate and there are some blurbs about it on the menus. But to place this in perspective, he noted that Fifth Group is already widely respected as a very professionally run business and its zero waste initiatives are secondary in importance to the company's image. Within circles concerned about sustainability, however, Fifth Group has become a leader, serving on boards and encouraging other companies to change their own practices (S. S. interview). Simon said that every week restaurateurs call him because they have seen the press Fifth Group has received for its zero waste efforts and they want to know how to adopt similar practices—often, he suspected, primarily to win similar publicity.

In reflecting on why others do not share his concern about the environmental impact of business, Steve Simon pointed out that many—unlike him—have children and future grandchildren who will inherit a world likely more inhospitable due to resource depletion, but, he says, “it's amazing to me how many people that do have kids don't think about this” (S. S. interview).

For Simon, zero waste is just the start, what he described as the “low-hanging fruit” of sustainability initiatives. Next his company is taking on the bigger challenges of reducing electric, gas, and water demand, all of which will require investment in more efficient equipment (S. S. interview).

5.7. The ZWZ program moves to a new home and seeks funding

5.7.1. *Elemental Impact*

In February of 2010 Holly Elmore founded Elemental Impact (EI), a nonprofit corporation that took over responsibility for projects she had initiated at the Green Foodservice Alliance, including the Zero Waste Zones (H. E. interview). Over the next several months the ZWZ program developed more structure to support both the zone effort and the new nonprofit. Elmore created a Participant Directory—a database of all businesses and institutions participating in a Zero Waste Zone. New ZWZ participants were also required to join at one of two levels of annual financial support: “Sprout” at \$250 with company contact information and brief description on the ZWZ website, or “Sapling” at \$500 with the added benefit of a dedicated company page on the site (“Join as a ZWZ participant,” n.d.). The program promised all participants these benefits:

- Guidance in meeting ZWZ Criteria
- Generation of environmental impact reports via the ZWZ Metrics Collection program
- Enhanced public image - the media loves the ZWZ!
- Listing in the National ZWZ Participant Directory (“Join as a ZWZ participant,” n.d.)

Elmore also created a ZWZ Supplier Directory that “allows foodservice industry purveyors to promote their products and services to operators committed to implementing sustainable business practices” (“Supplier Directory,” n.d.). Suppliers could join at three levels of annual financial support, with corresponding levels of exposure on the site: \$500, \$750, and \$950 (“Join as a ZWZ Supplier,” n.d.).

5.7.2. Seeking corporate and organizational support

Elemental Impact received additional funding through a hierarchy of four sponsorship levels for companies that were not necessarily ZWZ Participants or Suppliers, from a “Silver Partnership” for a \$2,500 annual contribution through a “Diamond Partnership” level of \$25,000 (Elemental Impact, n.d.a). By spring of 2012, Elemental Impact had 12 Gold Partners (\$5,000) and six Silver Partners, and five companies supporting through in-kind contributions (Elemental Impact, n.d.b). These included many businesses with an environmental or sustainability focus, like green cleaning-product purveyor EcoLogic Solutions and waste-grease recycler Griffin Industries.

Waste Management

A couple of months after Elemental Impact formed, the country’s largest corporate waste hauler, Waste Management (WM), signed on as the nonprofit’s first big sponsor at the \$10,000 Platinum level (H. E. interview). Holly Elmore said that at the time she could not have made it without this support since her organization was still very new and she had just hired an administrative assistant.

Elmore noted that she took “a lot of heat for my relationship with Waste Management.” Her willingness to seek collaboration with big business instead of disparage or be suspicious of it makes her an unusual environmentalist. She recalled telling her critics, “if you’re going to make a difference you have to deal with the big [corporate] players.” Elmore suggested that much of environmental advocates’ anger is misdirected:

Don’t vilify those that are answering the consumer demand—change the consumer demand. It’s not [the fault of corporate waste managers] Waste Management or Republic. They’re not awful because they created landfills to take all the trash that we accumulate; they’re just meeting a demand. (H. E. interview)

In December of 2010 Waste Management’s Area Vice President, Greg Yorston, invited Holly Elmore to educate the company’s southern regional staff on zero waste. As the ZWZ blog recounted, her presentation focused “on how the ZWZ program made good business sense and was not supported by government regulations or subsidies” (Elmore, 2010). The post optimistically reported WM’s apparent embrace of alternatives to landfilling:

Approaching the changing business environment with a long-term focus, WM executives are steering the company into the uncharted [sic] waters of the zero waste environment. With control of the disposal collection stream critical to overall profit generation, WM understands a R-R (repurpose, recycle) destination point is vital to maintaining a long-term relationship with their clients David Steiner, WM CEO, looks to the future and sees one without waste, and

has committed to seize every opportunity to turn waste into a resource that benefits our communities and the environment. (Elmore, 2010)

Indeed WM has taken substantive interest in waste diversion over the past few years. In 2009 it invested in Terrabon, a company that uses organic waste to generate renewable biofuel for transportation (Waste Management, Inc., 2010b). In January of 2010 WM invested in Harvest Power, which owns and operates North America's largest food and yard waste composting facility (located in Richmond, British Columbia) and is developing aerobic and anaerobic digestion technology to produce renewable energy from organic waste (Harvest Power, 2010). Later that same year, WM acquired a majority stake in Garick LLC, a manufacturer, marketer, and distributor of organic landscaping products and soil amendments like compost and mulch (Waste Management, 2010a). This acquisition of Garick added more than one million tons of processing capacity to WM's existing organics recycling operations. The press release observed:

The market for composting services is growing as consumers are increasingly demanding alternatives to conventional fertilizers for lawn and garden care, and municipalities and companies are seeking to increase the recycling of organic materials for beneficial use. Organic compost is considered part of the green retail market, which has been growing at 20 percent annually. (Waste Management, Inc., 2010b)

It might be difficult, however, to reconcile these apparent shifts at WM with the company's less publicized efforts to thwart organics diversion on a grand scale. As a lobbyist for the composting industry recounted in *BioCycle*, Waste Management—along with other major landfill and waste hauling interests like Republic Services, Inc., and the National Solid Waste Management Association—worked with Georgia's Environmental Protection Division to write the language overturning the state's ban on yard waste in landfills in 2011 even before the legislative session started, a change that allows more compostable material to be landfilled, not less, as detailed earlier in this case study ("State Rescinds Ban," 2011). Waste Management also supported similar repeal efforts in other states including Michigan and Florida (Sullivan, 2010b). *BioCycle* quotes the Center for a Competitive Waste Industry on WM's contradictions:

"A waste company cannot claim to be 'green' when it is working aggressively to repeal one of the country's most important recycling laws, the requirement to compost instead of landfill yard trimmings that is responsible for about a third of our diversion" (Sullivan, 2010b, p. 20).

Waste Management's support of Elemental Impact turned out to be short lived. The next year the company chose not to renew its sponsorship, a source of funding that Holly Elmore had been counting on. Elmore attributes this at least in part to a change of command: Greg Yorston, the WM Area Vice President who had shown so much interest in zero waste, was promoted to a Senior Executive Vice President position and his successor did not share the same enthusiasm for Elemental Impact's work. WM as a corporation has shown no further interest in the Zero Waste Zones or related projects.

Fickle support

Waste Management was not the only ZWZ supporter that lost interest; this kind of reversal proved to be a problem with other supporters as well. Said Elmore, “people drop me like hot potatoes.” For example, Atlanta Recycles has not been involved with the ZWZs since it decided to stop attending meetings to after a group attempt to develop a metrics tool ended in stalemate (H. E. interview). The Georgia Recycling Coalition, which served as one of the original partners for developing the ZWZ-Downtown Atlanta, eventually dropped its support, too. And an employee of EPA’s Region IV office, one of the “Green Musketeers” as Holly Elmore dubbed her group of three advocates who gave presentations on the ZWZ effort in the early days, stopped her work on behalf of the zones in 2009 (H. E. interview). As Elmore recalled, her former supporter grew exasperated with how efforts were proceeding and said, “Holly, I can’t stand the chaos!” to which Elmore replied, “That’s how things get created!”

5.8. Atlanta municipal government shows interest

In early 2010, around the two-year anniversary of the ZWZs, the City of Atlanta issued a press release on its ZWZ participation and support. The release quoted Mandy Mahoney, at the time Director of Sustainability for the City of Atlanta:

Supporting Zero Waste Zones benefits the environment, local businesses and will ensure long-term cost savings for city government and the community through promoting best practices that minimize waste and recover valuable materials for reuse. (City of Atlanta, Mayor’s Office of Communications, 2010)

The release also includes a statement attributed to Atlanta’s mayor, Kasim Reed:

The city’s support of Zero Waste Zones illustrates our commitment to moving Atlanta toward becoming a top 10 city for sustainability. One critical step in this process is to develop a viable zero waste plan that will create green jobs and reduce the green house gas emissions of discarded materials. ZWZ complements our zero waste plan and vision and is the economically and ecologically right thing to do for the city. (City of Atlanta, Mayor’s Office of Communications, 2010)

In January of 2011 the City of Atlanta signed on as a ZWZ Participant, at the Sapling level. As recounted on the project’s blog, “the game plan is to develop a phase-in strategy of the ZWZ Criteria at the City Hall foodservice operations and then extend zero waste practices to the entire complex” (Elmore, 2011a).

5.9. Learning that back-of-the-house effort is just one step toward zero waste

Much of the Zero Waste Zones’ activity focused on encouraging businesses in a particular sector to divert material from the landfill, but they also provided opportunities for participants to learn more

about waste reduction challenges beyond their own operations. To that end, Holly Elmore organized field trips for ZWZ participants to the local facilities that accept and sort recoverable material.

In March 2011 they visited SP Recycling, a subsidiary of SP Newsprint, a paper mill located in Dublin Georgia. SP Recycling provided recovered newspaper as a raw material to its Dublin mill and also served as a material recovery facility (MRF), the destination for many of Atlanta's recycling haulers. There the group learned that glass is a serious problem in single-stream recycling: "Second to labor, glass disposal is the largest expense at the SP Recycling facility. Now the challenge is finding an economically viable end use to keep glass from the landfill," Holly Elmore wrote on her blog post about the trip (Elmore, 2011d). Later that month a group of ZWZ leadership visited Pratt Industries' East Point Materials Recovery Facility southeast of Atlanta. There they witnessed the massive piles of contamination—the material that the MRF could not recycle and would later discard in the landfill. The group received guidance on how foodservice businesses can better separate recyclables to reduce contamination at the facility (Elmore, 2011e).

It was one of these MRF visits that Steve Simon, Fifth Group partner and ZWZ-Midtown Champion, realized that a restaurant's actual diversion rate is determined as much by a recycling facility's own limitations as it is by the amount of material his businesses are willing to collect. He recalls thinking that Fifth Group restaurant Ecco was getting very close to 100 percent, but "after spending more time with Holly in some of the recycling facilities, what we realized is that they are more selective and they discard a lot more than what I was aware of" (S. S. interview). Simon learned that the size of a piece of material can matter; generally, anything smaller than a fist that is hauled to the facility does not get recycled. The variety of plastics is also a factor; even when some types technically are recyclable, a facility may choose not to process them because the recyclable commodities may not bring enough money on the market to justify sorting and saving them. Clean food wrap generally does not get recycled, including aluminum foil even though aluminum in other forms is considered valuable and is regularly recycled. Mr. Simon was surprised to learn that even the standard five-gallon plastic buckets that cleaning chemicals come in are discarded instead of recycled. Given these realities at material recovery facilities, he estimated that Fifth Group's diversion rate was more like 80-90% than the 95-98% he had originally determined based solely on what was hauled away from the business (S. S. interview).

Glass presents special problems for those in the foodservice industry who wish to recycle. As an owner of restaurants with full bars and extensive wine lists, Steve Simon was particularly concerned about this material, which accounts for at least 20 percent of his businesses' waste stream. He learned that very often glass does not get recycled because the cost of the virgin material is so low. As noted earlier in the Boulder case study, glass is also a nuisance in single stream recycling as it can easily break into miniscule shards that contaminate other recyclable materials like paper and plastic, making them unfit for further use. Fifth Group has a hauler willing to collect glass for recycling, but, Mr. Simon said, "to be honest, I don't feel like it's a great program."

5.10. Regional and national expansion of zones—and project focus

According to a ZWZ blog post from May 2009, new zones were in the planning stages for cities on the outskirts of Atlanta including Decatur, Athens, and Milton (Elmore, 2009e). Those zones have yet to form. Instead, the original zone concept has spawned other projects.

5.10.1. *Columbia, South Carolina: the first ZWZ “expansion city”*

Existing and prospective ZWZ participants in the Atlanta region were able to tour their fellow participants’ operations to learn about challenges and opportunities of zero waste in practice. But as publicity for her ZWZ projects grew, Holly Elmore found rising demand from other organizations and communities beyond Atlanta for visits to the zones. One tour she arranged was for the South Carolina Hospitality Association (SCHA) in August of 2011 (Elmore, 2011h). The group included business association representatives and City of Columbia Councilman Daniel Rickenmann. On its tour the group learned about the experiences of several zone participants and advocates including the Georgia Restaurant Association, Steve Simon of Fifth Group, Jimmy Chancellor of the Hyatt Regency Atlanta, Patrick Cuccaro of Affairs To Remember catering, the Georgia Restaurant Association, and EPA’s Region IV office, among others (Elmore, 2011h).

A few months later in November the South Carolina group made a second visit to Atlanta for a tour focusing on food waste diversion (National Restaurant Association, 2011b). A post about the visit on the NRA’s website reported that the “members of the tour plan to reconvene in January [2012] to discuss next steps in adopting a zero waste initiative in Columbia” (NRA, 2011b). One obstacle is the lack of a composting facility in the area to accept food waste. But SCHA did receive a \$100,000 grant from the EPA to help with its other recycling efforts including recycling bin purchases, development of a glass recycling program with free hauling, and creation of a training program for hospitality workers (NRA, 2011b). And Daniel Rickenmann, the Columbia councilman who toured the Atlanta ZWZs, is also chief operating officer of W2E Organic Power which is building an anaerobic digestion facility in the city (“DHEC Approves,” 2011). Controlled, contained anaerobic digestion breaks down organic waste under oxygen-free conditions, a process that—besides generating methane for capture as biofuel—provides an environmentally sound alternative to composting for handling food scraps.

Given the South Carolina contingent’s serious interest in (if not yet a full plan for) a zero waste initiative of its own, Holly Elmore referred to Columbia as “the first ZWZ expansion city” beyond Atlanta (Elmore, 2011h). The ZWZ website added guidance on how other communities could develop their own zero waste zones (“Bring zero waste,” n.d.).

5.10.2. *The National Restaurant Association collaborates on the ZWZs*

After establishing a new home for the ZWZ program under her nonprofit, Elemental Impact, Holly Elmore said that she had the independence she needed to discuss with a program director at the National Restaurant Association (NRA) how to pursue waste reduction in the industry on a broader scale. The NRA had already created its own “Conserve Sustainability Education Program,” an online resource to help “restaurants to reduce energy, waste, and water” that was funded by the Turner

Foundation (NRA, n.d.). Conserve Program Director Chris Moyer and Holly Elmore became a team (nicknamed “the Chris & Holly Show”), with their first presentation in a pre-conference session at the US Composting Council’s conference in California in January of 2011 (Elmore, 2011b). The presentation, called “Mobilizing the Foodservice Industry to Embrace Organics Collection” (n.d.), asserted that this industry could be “the catalyst to bring the community together to embrace zero waste initiatives.” Slides pointed out that foodservice is the largest producer of food waste going to landfills and therefore holds the most potential for organics waste reduction, and that the NRA—as a major lobbying group in Washington and an association with the ability to develop and disseminate training protocols—could best promote change.

Also in January, Holly Elmore spoke at the NRA’s board meeting in Palm Springs, to the Sustainability and Social Responsibility committee (H. E. interview). Less than a month later, Scott DeFife, the NRA’s Senior Executive Vice President for Policy and Government Affairs, announced at the ZWZ two-year anniversary press conference the NRA’s collaboration “with the Atlanta-based Zero Waste Zone program to identify best practices, create resources and measure the impact of perishable organic waste management efforts” (NRA, 2011a).

In September of 2012 the NRA formally acquired the ZWZ program “with intentions to expand the program nationally within the state restaurant network” (Elmore, 2012c).

5.10.3. *The Sustainable Food Court Initiative and the first “national zone”*

In July of 2011, FORTUNE magazine’s online publication profiled Holly Elmore as one of “6 Green Leaders in Red States” (DuBois, 2011). The profile did not mention Atlanta’s Zero Waste Zones at all. Instead it described Elemental Impact and Elmore’s most current project at the time, reducing waste generated by food courts. Elmore called it the Sustainable Food Court Initiative (SFCI).

In February of 2011, Elemental Impact launched the SFCI as a task force in partnership with the National Restaurant Association (Elmore, 2011c). The initiative’s mission is to bring zero waste to a specific segment of the foodservice industry, food courts, which have challenges different from the restaurants that populated the early Zero Waste Zones. For example, the property where the food court is located (such as a mall or airport) may have waste contracts for the entire property that are hard to adjust for an environmentally conscious quick-service food tenant, and franchisee/franchisor contracts usually impose inflexible legal restrictions and obligations (Elemental Impact, n.d.c).

Zero waste at Atlanta’s international airport

The SFCI’s first undertaking, announced in June of 2011, was a pilot project at the Hartsfield-Jackson Atlanta International Airport—the world’s busiest airport in terms of annual total number of passengers (Elmore, 2011g; Hetter, 2013). The airport disposes of more than 19,000 tons of waste annually, much of it organic material (Platt, 2012). The pilot’s original goal was to develop a back-of-the-house organics collection program starting in November of 2011 (Elmore, 2011g). Those plans were delayed and revised when a new opportunity arose as the airport readied for new concessionaire contracts. (Nonetheless, in the fall of 2011 the Chicago Department of Aviation presented the Hartsfield-Jackson Atlanta

International Airport with the 2011 Going Green Airports Award for its SFCI pilot [Chicago Department of Aviation, n.d.]

At the same time that planning for the SFCI's first project was underway, the City of Atlanta issued a request for proposal (RFP) for food and beverage concessions for the airport (H. E. interview). In May of 2011 the city released an addendum which, among other changes, replaced the RFP's original language regarding packaging, "environmentally friendly and/or innovative packaging or transportation devices that facilitate travel are highly encouraged," with an unusual requirement: "concessionaire shall use compostable serviceware along with consumer facing packaging and source separate all food service wastes for direct transport to off-airport composting facilities" (Elmore, 2013).

Steve Simon of Fifth Group credited Holly Elmore with "singlehandedly [persuading] the City of Atlanta and the airport to include zero waste policies in the RFP." Elmore acknowledged her role but also pointed to the "renegade" leadership of Michael Cheyne, Director of Asset Management & Sustainability at Atlanta's Department of Aviation (H. E. interview).

The ZWZ blog reported, "The new concessionaires will run the entire gamut from local concepts to the nation's largest chains and quick service restaurants. This [RFP] provision serves as a catalyst to evolve restaurant consumer packaging at every level" (Elmore, 2011k). The SFCI assembled a team including Elemental Impact, the National Restaurant Association, the Institute for Local Self-Reliance, and the Foodservice Packaging Institute, among other businesses and organizations, to research the needs of airport concessionaires subject to the new zero waste contract provisions and develop educational materials (Elmore, 2012b).

In April of 2012 the SFCI team's Sustainable Packaging Committee released an information packet on the airport's Compostable Foodservice Ware Program ("Compostable Foodservice," 2012). The materials explain the new contract's mandate and provide a brief justification for composting, focusing on its soil fertility and storm-water-retaining benefits and the GHG methane emissions averted by keeping organics out of landfills. Included are links to lists of what the airport considers to be acceptable compostable foodservice ware: products that are certified by either of two third-party agencies, Biodegradable Products Institute or Cedar Grove Composting ("Compostable Foodservice," 2012). Cedar Grove, based in Washington state, is a privately-owned composting operation that won Seattle's yard waste contract in 1989 and later grew into the country's largest dedicated composting facility (Emerald Services, Inc., n.d.). This status has given the company influence in establishing standards for compostable materials, and it has even developed a line of its own biodegradable packaging materials specifically designed for compatibility with municipal collection and sorting (the distinctive brown product coloring means manual sorting is no longer necessary) and commercial composting facilities (the materials break down best under those specific conditions) (Cedar Grove Packaging, n.d.a; Cedar Grove Packaging, n.d.b).

The Atlanta airport's composting program would be tested first with foodservice tenants in the new Concourse F (Elmore, 2012a). The airport's other concourses planned to phase in zero waste practices as old contracts expire over an 18 month period (Elmore, 2012a).

ZWZ-National Zone

The “National Zone” came about when foodservice operator HMSHost decided to work with and support Elemental Impact on its SFCI project. As reported on the ZWZ blog, HMSHost’s original commitment to adopting zero waste principles at its concessions operations at three properties—Tampa International Airport, Charlotte Douglas International Airport, and one of Simon Property Group’s malls in Charlotte, North Carolina—formed the basis for the ZWZ-National Zone, launched in October of 2011 (Elmore, 2011i). But it happened rather casually, as Holly Elmore explained. She had been on the phone with HMSHost’s Vice President of Supply Chain & Analysis negotiating the company’s sponsorship package for Elemental Impact, and Elmore agreed to “throw in three ZW Participations, thinking I knew they had two places in Atlanta.” Instead the VP crossed state boundaries by selecting locations at properties in North Carolina and Florida as its official ZW Participants. This led Elmore to conclude on the spot, “I guess that’s the National [Zero Waste] Zone” (H. E. interview). The National Zone added two more participants: farming operation White Oak Pastures in Bluffton, Georgia, and a Midwestern foodservice distributor, Piazza Produce (“Zero Waste Zones – National,” n.d.).

5.10.4. *Beyond zero waste: Sustainable Action Zones*

In one of Elemental Impact’s presentations given in December of 2010, a slide titled “ZWZ Evolves” pointed to a future shift in the zone program from a focus solely on reducing waste to broader concerns including “energy conservation” and “toxic free environment.” For this expanded effort Holly Elmore chose a name change: “Sustainable Action Zones,” which she trademarked and gave the tagline, “an integrated approach to sustainability” (H. E. interview). As Elmore explained, “I’ve always thought and known that the Zero Waste Zones were the low-hanging fruit.” Other interviewees also used this phrase to describe their zero waste efforts, acknowledging that there are more challenging environmental problems they will need to take on in the future.

5.11. Atlanta’s Zero Waste Zones: A Discussion

Zero waste in Atlanta is still new and very much evolving, so it is premature to attempt a full evaluation. Nonetheless the early ZWZ planning and implementation yield some insights into a method of pursuing zero waste that appears to differ significantly from more government-directed efforts as in Boulder. Following is a discussion of major observations and themes that have emerged from zero waste efforts in Atlanta, drawing from the story of the case above and additional material from interviews of the actors involved and relevant theory.

5.11.1. *Factors influencing pursuit of zero waste in Atlanta*

The EPA Office of Resource Conservation and Recovery’s 2010 *Materials Matter: Resource Conservation Challenge Update* includes among its summaries of local activities:

Atlanta has made a commitment to reducing environmental impacts from homes, workplaces, and communities. Upon declaring part of its city as a Zero Waste Zone in February 2009, Atlanta became one of the nation’s first Zero Waste Zones, and the Southeast’s first such zone. (p. 25)

Attributing an action to a city, as this excerpt does, implies that it is a policy or project of the municipal government. Indeed many zero waste efforts across the country are. But in Atlanta the Zero Waste Zones were initiated and led by the private and nonprofit sectors.

A self-selected group of active ZWZ participants

As the case study recounts, the ZWZ's participants include some very dedicated representatives of businesses and institutions with both personal and professional interests in furthering the cause. But to fully understand the reach of the ZWZs, participation should be placed in context. According to the Georgia Department of Public Health's records of health inspections, Fulton County—which includes Atlanta and much of its metro area—contains more than 4,400 foodservice operations (Georgia Department of Public Health, n.d.). This means that, based upon the most recent count in the “Participant Directory” on the Elemental Impact website, the fewer than 50 total Atlanta-area businesses and institutions that signed on as ZWZ participants represent only about one percent of the relevant foodservice population.

The low ZWZ participation rate suggests two reasonable explanations: (1) many foodservice operators are not aware of how zero waste practices could benefit them, or (2) the net benefit is nonexistent or too small to be worthwhile for them to pursue zero waste. The second explanation likely holds true for non-participants, given the responses of ZWZ participants interviewed for this thesis regarding the net financial impacts of their ZW efforts. Reasons for participation are explored further in later sections of this discussion.

A business community influential in many ways

Businesses not only made up the majority of the ZW participants, they also provided a great deal of financial support and networking base for the nonprofits developing the ZWZs and related projects. Corporate giant Waste Management's \$10,000 contribution proved indispensable during Elemental Impact's first year of operation. But WM's later decision not to renew its financial commitment shows that this support cannot necessarily be counted on long-term.

Businesses—like other interest groups—also continually shape the environment that determines how materials management is handled. The EPA's stricter rules on landfill technology for groundwater protection resulted in a transfer of landfill responsibility from resource-strapped local governments to the private sector, which in turn enabled the ascendance of corporate waste giants that continue to wield political influence today. Examples from this case are the recent wave of landfill yard waste ban repeal efforts pushed behind the scenes by big waste companies and their successful revision of Georgia's codified solid waste-reduction hierarchy to favor landfill gas collection systems over composting.

The waste-reduction future will also depend to a great extent on ideas from the business community. This is why Holly Elmore deliberately invited collaboration with groups like the Sustainability Packaging Coalition and Paper Recovery Alliance that are developing the products of the future (H. E. interview). Said Elmore of these groups: “they're pushing the envelope of what's available; they're research.” An

important question to ask is whether the current business climate and the regulation—or lack thereof—shaping it is ideally suited to promote that kind of innovation.

Nonprofits out in front and behind the scenes

Nonprofit groups figure prominently in this story, starting with the Green Foodservice Alliance, the ZWZs' first home; Atlanta Recycles, the Georgia Recycling Coalition, and other groups that advised the effort; then Elmore's creation of her own nonprofit, Elemental Impact, which took over responsibility for the zones and developed related projects; and later the National Restaurant Association, which is poised to take zero waste in the foodservice industry nationwide.

It is worth noting that the line between private and nonprofit interests can be blurred. For example, the National Restaurant Association is a nonprofit—but one that comprises for-profit foodservice enterprise. Similarly, the Southeast Recycling Developing Council (SERDC), mentioned earlier in the case, is a 501(c)3 with an educational mission but its activities are very much aimed at shaping local government decisions that affect the supply of material inputs used by SERDC's corporate sponsors. In this way, SERDC's activities might resemble those of the typical lobbying firm working on behalf of private sector interests.

As Holly Elmore described the role of her nonprofit (and now consulting firm), “what we do at Elemental Impact is we find things that aren't being done, that could be done, and we get them done” (H. E. interview). Elmore's own individual commitment is clearly a critical factor in the story. In answers to the question of what is the driving force behind zero waste in Atlanta, nearly every interviewee cited Holly Elmore. If this effort were strictly directed at changing a governmental program or process, Elmore could be called in political science parlance the “policy entrepreneur.” But, as she made clear, change through government channels was not necessarily her preferred method, although the implicit intention was an effect not unlike public policy.

Even though the major actors in this story come from the business world, government at different levels has affected or actively involved itself in Atlanta's zero waste planning and implementation, proving critical at certain points. Important to recognize is that government influences as much through the actions it does not take as through those it does.

Federal government in a loosely facilitating role

The Environmental Protection Agency, through its Region 4 staff, took on a non-regulatory, facilitating role as a participant in the ZWZs' planning meetings and early outreach. This is part of the EPA's continuing effort to promote a shift away from waste management and toward sustainable materials management as originally envisioned in its report, *Beyond RCRA: Waste and Materials Management in the Year 2020* (U.S. EPA, 2003a). This supporting, encouraging role for independently-initiated efforts—also evidenced in this story by EPA's award for the nascent ZWZ effort and project summary in the 2010 *Materials Matter* update—reflects the limits on what the agency can do in the absence of any legislated federal mandates giving it more regulatory authority to push a serious materials management agenda.

State government at turns earnest, misguided, and helpful

The state of Georgia has contributed both directly and indirectly to the ZWZs. Georgia's passage of the Comprehensive Solid Waste Management Act in 1990 followed a national trend of reinforcing municipal responsibility for recycling infrastructure and instilling in households the recycling ethic that influenced many in business management as well—including those who would later become ZWZ participants.

The CSWMA's ban on yard waste in landfills (at least before it was repealed) likely raised conventional disposal costs for commercially-collected yard waste, providing a profitable opportunity for the emergence of composting operations like Greenco. Greenco also benefited indirectly from Georgia's 2005 waste characterization study which can be credited with heightening awareness of the state's largely unaddressed food waste, particularly in the Atlanta region which generated much of it. The absence of a state plan for dealing with food waste—and reason why the ZWZs and SFCI stepped in—is likely related to the fact that Georgia conducted its first major waste characterization study well after passage of the state law (the CSWMA) that set priorities and guidelines for comprehensive solid waste management policy.

Certain state agencies played more immediate roles in the ZWZ story. Georgia's Environmental Protection Division held the power to grant a permit to Greenco as the state's first commercial food waste composting operation, without which the ZWZ criteria could not include organics waste collection—a significant component of the targeted sector's waste stream. The uncharted territory of permitting this unusual facility provided a learning opportunity for the state agency. Holly Elmore credited the Sustainability Division of the Georgia DNR—particularly staff members Marlon Gottschalk and Roy Edwards (the official who helped Elmore develop the three criteria for participation in a ZWZ)—with providing uniquely unwavering support for her work before the division lost its funding and effectively disappeared (H. E. interview).

A largely absent local government with potential for leadership

The Atlanta municipal government lent at least token support for the Zero Waste Zones by joining as a zone participant in January of 2011 and issuing a press release expressing its support for the ZWZs. At this point the Atlanta municipal government's most substantive contribution to zero waste is the action that its Office of Sustainability and Department of Aviation took to include the compostable serviceware mandate in the airport's concessionaire RFP.

5.11.2. *The strengths and vulnerabilities of private sector-driven change*

Because the zero waste effort in Atlanta depended mainly on private and nonprofit sector actors to achieve its objectives, it followed a path that perhaps diverged from a government-driven effort in certain ways.

First, Holly Elmore initiated the Atlanta area's Zero Waste Zones and served as the project's committed leader so it was primarily her vision, informed though it was by a shifting group of collaborators, that determined the form and trajectory of early zero waste efforts. Her professional interest and experience lay in foodservice—so the zero waste campaign concentrated on foodservice as opposed to, say,

residential waste, which is far more common in other communities pursuing zero waste and something that the City of Atlanta is not yet doing, or the food processing industry which is the largest producer of food waste in the Atlanta metro area.

Elmore also decided to use the unusual approach of spatially-bounded zones to organize zero waste activity, something that no other community in the United States has done. The reasons for the zones—primarily for route density and access to pre-established business networks—made sense with the original zones but seemed to apply less as some later zones developed, like the one for caterers and the “National Zone” which appears to be a catch-all for scattered zero waste projects that have little in common geographically. If a goal of zero waste is to encourage the farthest-reaching waste reduction possible, this suggests that pursuing a community-wide program (for example, a city or even entire region) would be desirable. And achieving that reach with any efficiency likely would require the resources and authority of local government. As explained further on in this discussion, however, there are reasons why advocates of change often choose not to engage government fully or at all.

Second, the lack of a government mandate for the ZWZs arguably allowed personality and idiosyncrasy to wield more influence, achieving but sometimes hindering progress. Holly Elmore’s extraordinary dedication to her cause and talent for bringing various interests together at the same table accounts for the high degree of support she was able to win in the early stages of her projects. But this same drive could render these efforts vulnerable to personality conflict when other disagreed with her methods. Elmore found that people and organizations dropped their support all too easily. Every story about change agents has its moments of shining cooperation and intractable conflict. But establishing zero waste in legislation or an executive order might have forced resolution of problems related to the ZWZs when friction or loss of momentum born of personal conflict sent partners scattering.

On the other hand, maverick-driven change operating outside the bounds of formal policy processes can garner extra publicity (as national media attention to the unusual model of the ZWZs attests) and take advantage of business networks to develop projects in a state of government inertia. But project development is a multi-stage process. In her interview, Holly Elmore acknowledged that what she does best is initiate projects, letting others work on the details of implementation—as illustrated by the NRA’s acquisition of the ZWZ program.

Two interviewees voiced some concern about the rapid, shifting focus of the zero waste projects. Said Tim Trefzer of the Georgia World Congress Center:

When the Zero Waste Zone was created, I remember reading about it and thinking it was really neat—but that was a few years ago and it’s just not there anymore. No one talks about it. I know all about it because I’m part of it, but none of my friends or people even that I work with, some of them, even know what the Zero Waste Zone is. So I think it’s kind of lost its luster and I just don’t think people talk about it anymore.

Dan Hourigan of the Midtown Alliance observed perhaps a premature broadening of geographical scope:

I know [Holly Elmore's] trying to take this thing national, at least regionally ... she's talked about other states and cities and I think that's fantastic. But I would love to see more focus on getting the numbers up here in Atlanta before taking it elsewhere. I feel like we're still working on developing the model here of how this can be ... kind of a sustainable movement before we take it—before she takes it—nationally. But that's totally her prerogative to do so.

Hourigan's last comment raises an important point: private sector-initiated projects that deliver some kind of public benefit are, nonetheless, ultimately not accountable to the public. This contrasts with government programs, which are generally subject to periodic study and evaluation, and for which affected or interested constituents can provide on-the-record feedback, e.g., by commenting at public hearings or voting. Of course, it is naïve to think that government programs are always designed, implemented, or evaluated with the public interest—a terribly protean concept, anyway—as the primary concern. Many activists are aware of this. After all, a lack of government leadership and action on waste management in the commercial sector was a major reason why the ZWZs and their spin-off projects came into being.

5.11.3. *Ambivalence about government involvement in zero waste*

Some of the language surrounding the ZWZs suggests that government involvement is undesirable, ineffectual, or otherwise unnecessary. As Holly Elmore said in her interview, “We are industry driven. We're doing this because it makes good business sense—not because it's government demanded.” An article on the ZWZs in *The Atlanta Journal and Constitution* summarized an early lesson learned: “So what can this urban tale teach the average consumer? First, it's up to you to ‘take responsibility and learn,’ Elmore says. Don't expect your overworked local government or municipality to lead the way” (Ford Goldman, 2009). It may be significant that this excerpt's last sentence could be either a paraphrase of Elmore's words or the reporter's own opinion; it reflects, after all, a culturally dominant attitude toward government. This perception of government impotence is understandable, given the recent history of waste management described in the case background and the more general waves of anti-government sentiment starting in the late 1960s in the United States that make positive opinions of government rare in public discourse (Dionne, 1991).

But interviews with others involved with the ZWZs suggest considerable support for government involvement; not one interviewee for this case study was adamant that there could or should be no role for government in zero waste.

Steve Simon of Fifth Group was very direct in his advocacy of government involvement. In his interview he noted, “[Holly Elmore] is not a big proponent for [achieving sustainability] through legislative processes, but I am. I think it should be a requirement.” He observed that the ZWZ effort has used mainly a private-sector approach “because politics are a nightmare, and nobody wants to be told by the government what they have to do.” Simon appreciated that Elmore wants ZW practice to be a good business decision—but, he continued:

As a businessperson I'm just less patient than this, and I think, look, once there's something really important that's found out, people should just have to do it. And if you don't do it, you

should pay more, like you should pay to throw away trash So as the person that has sustainability and air quality and all the other things on my mind, in my opinion, now that we know that there are positive impacts of redistributing the waste stream and recycling, we should force business to figure out how to become more thoughtful and say, ok, if it costs ... \$30 a ton to have things tipped in Georgia, make it be \$80 a ton, make it be \$100 a ton, so that it more quickly encourages people to figure out how they're going to recycle—because, quite honestly, disposition of your waste stream or trash is really a very small part of what you do. (S. S. interview)

Simon concluded that waste diversion and reduction efforts should harness both government and the private sector: “I think you could use the power of one and the brains of the other to create something that’s important.”

All the responses of the ZW participants interviewed for this case suggest that the financial benefit and/or cost of adopting ZW practice is relatively minor; at this point, waste reduction does not make much difference in the bottom line either way. This reality conflicts to some degree with Holly Elmore’s statement above: “We’re doing this because it makes good business sense—not because it’s government demanded.” This statement also seems to preclude the possibility that a government mandate, imposed to further some social or environmental goal, could also be good for business. But history contains many instances of environmental regulation spurring private sector development. One example can be found in the background section of this case study: The new federal landfill regulations of the early 1990s presented an opportunity for big, well-capitalized waste management companies to profitably assume a former function of local governments, many of which could not afford the increased costs of compliance.

Holly Elmore’s diligence in seeking zero waste language in the RFP for the Atlanta Hartsfield-Jackson Airport, which is owned by the City of Atlanta, shows that she herself recognizes an important role for government in waste reduction. Elmore has even suggested that the degree of government involvement will vary across localities. She recalled that during the early days of the ZWZs, a friend of hers who had worked for Atlanta’s government advised her to keep the city informed but not directly involved because local bureaucrats will only “become snags” (H. E. interview). But, Elmore continued, “Is that every city? Doesn’t seem so with Columbia[, South Carolina]; the city’s a driver in this [emerging zero waste effort]. I think it’s just all going to depend on how the city’s structured, the personalities, what motivates them” (H. E. interview).

5.11.4. *Zero waste’s impacts on profit and potential to induce innovation*

This seeking of government regulatory involvement in the Zero Waste Zones suggests that if a mandate is necessary to compel change, then waste reduction does not significantly benefit firms financially, at least under present circumstances. The logic is that if it did, then firms, motivated as they are by bottom-line considerations, would eagerly adopt these kinds of practices on their own. But Porter and van der Linde (1995) argue against this assumption about firm behavior:

The possibility that regulation might act as a spur to innovation arises because the world does not fit the Panglossian belief that firms always make optimal choices. This will hold true only in a static optimization framework where information is perfect and profitable opportunities for innovation have already been discovered, so that profit-seeking firms need only choose their approach.

Instead, the actual process of dynamic competition is characterized by changing technological opportunities coupled with highly incomplete information, organizational inertia and control problems reflecting the difficulty of aligning individual, group and corporate incentives.

Companies have numerous avenues for technological improvement, and limited attention. (p. 99)

In theory, then, ZWZ participants may have needed an exogenous force to push through their own “organizational inertia,” “control problems,” or “limited attention” so that they could benefit from ZW practice while still meeting environmental goals.⁸ But based on the interviews, even among those ZWZ participants who experienced cost savings from increased recycling, the financial gains were relatively minor.

Said Dan Hourigan of the Midtown Alliance: “Like many things in sustainability there’s kind of an up-front cost that, in most cases, is a break-even in the long run I think restaurants may have a tough time swallowing that, especially in these times.”

Randy Childers of the Hyatt Regency Atlanta noted that recycling, as opposed to landfilling:

doesn’t save us a huge amount of money. When we evaluated the food-to-compost program it was a little better than break-even; I think we saved about five or six thousand dollars a year on that. So it wasn’t a major savings, but at least it had some net savings and allowed us to do the right thing.

Childers observed, “Cost neutrality is an important driver, because businesses are disinclined generally to incur additional expense, but that hasn’t been the case [for the Hyatt Regency Atlanta]—it saves us a little bit.” According to his colleague, Jimmy Chancellor, “Even if we only break even selling something or getting a little money back on it, it’s a plus for us.”

Steve Simon of Fifth Group concluded about his businesses’ zero waste efforts, “from a cost standpoint, for us it’s been neutral.” Similarly, Tim Trefzer of the Georgia World Congress Center surmised that his facilities’ early zero waste action “is just a wash” in terms of dollars spent and saved. It is perhaps significant that the Congress Center, as Trefzer reported, did not find it necessary at the time to carefully track the numbers.

⁸ ZWZ participation is not a regulatory requirement so it is not valid to judge it strictly as such. However, the experiences of those choosing to participate and adhere to the project’s rules at least suggest possible effects of a mandate.

Thus Atlanta's ZWZ practices do not appear to significantly affect the bottom line of participants either way. Moreover, any technology or process changes that they adopted hardly qualify as the "innovation" that Porter and van der Linde (1995) discuss since the main effect of the ZWZs was to encourage broader use of existing recycling technology rather than to advance the technology itself.

This is not to say that waste-reducing government intervention has no potential to spur innovation. The compostable serviceware requirement in the Atlanta Hartsfield-Jackson airport RFP (spawned by the ZWZs' sister project, the Sustainable Food Court Initiative) is still very new so it is too early to judge its ability to generate innovation and/or cost-cutting. As Porter and van der Linde (1995) assert, innovation in response to regulation (which must be well-designed according to their criteria) is an uncertain and dynamic process that takes time, and any cost-cutting effects are likely to occur in the longer rather than shorter term. At least in Atlanta there is some recognition of government intervention's potential for innovation, evidenced by Holly Elmore's framing of the RFP's mandate as "a catalyst to evolve restaurant consumer packaging at every level" (Elmore, 2011k). It is worth tracking the mandate's effects over time to see if it indeed delivers on this prediction.

5.11.5. *The pervasive power of the recycling ethic*

If profit maximization is not the main driver at this point, then there must be other compelling—if less obvious or publicized—reasons for the ZWZ's participating firms to voluntarily pursue the three-prong waste reduction. A likely reason is peer pressure for a greater good. Steve Simon explained:

[Holly Elmore is] more passionate than anybody that you've ever met about anything, and you can't tell her no. I mean, she will not allow you to tell her no if she needs your help—which I think is great. It has rubbed some people the wrong way, some people who don't necessarily want to get involved, but she has literally pulled together some of the smartest and some of the most committed people [concerned about] climate change overall and ... she puts this above everything else in her life. (S. S. interview)

Ambec et al. (2011) conclude from their survey of recent organizational and behavioral economics literature that "the rationality of the firm is driven by its manager, who has motivations and objectives other than profit maximization" (p. 5). But why recycling? The next sections explore how and why an environmental ethic influences these motivations and objectives in business.

Inter-business sharing for sustainability

The Hyatt Regency Atlanta's application for the 2010 Good Earthkeeping Award notes, "While we thrive in a very competitive industry and appreciate good competition, this year something has changed. We have begun to share our knowledge and experience with our direct competitors for the overall good of the environment" (R. Childers, personal communication, c. 2009).

In a 2011 ZWZ blog post titled "Sustainability = Sharing," Elmore quoted Linda Dunn, HMS Host's VP Supply Chain & Analysis, who spoke at the National Restaurant Association's September board meeting:

A true leader, HMSHost is equally committed to blazing the sustainability trail for the foodservice industry and SHARING their experience with fellow operators. “The whole process is about learning – identifying the best practices and bringing more participants aboard in our effort to reduce waste,” Dunn says. “We want to share those learnings.” (Elmore, 2011j)

Elmore ended the post with this:

When it comes to sustainability, industry leaders put their competition hats on the shelf and work together with their competitors on discovering solutions for practices that harm the environment. SHARING and collaborative spirit is integral to the leaders' sustainability commitments. (Elmore, 2011j)

Why would firms that otherwise compete decide to cooperate in this particular issue area? First, it should be noted that not all ZWZ participants are in direct competition with one another. For example, the Georgia Dome sports stadium cannot realistically take business from any of the Fifth Group fine dining restaurants. And the South Carolina contingent that visited Atlanta to learn about the local ZW practices poses no competition to Atlanta-metro firms because the two groups operate in geographically distinct (and distant) markets.

But many Atlanta businesses do compete, such as the membership of ZWZ-Caterers. The answer to this question of willingness to share might be deduced from interviewees' responses regarding the financial impacts of their zero waste practices on their operations. The finding that waste reduction has a negligible effect on the bottom line one way or the other may account, at least in part, for why competing businesses are willing to share ZW best practices: They stand to lose little financially from sharing because they have gained little financially from pursuing ZW. A firm obviously will not voluntarily disclose more lucrative strategies, for example its highly successful marketing tactics, to its direct competitors because to do so would significantly threaten its advantage—and thus profits—in the marketplace.

But this last scenario differs from the waste reduction goal in that business marketing strategies generally have no broader public-good goal attached to them, while waste reduction—at least implicitly—does. Thus it is also possible that firms' willingness to share sustainability approaches with their competition may simply reflect employees' and business owners' strong sense of personal environmental responsibility, transferred to their places of work.

Steve Simon made clear that Fifth Group's zero waste efforts were not of primary importance to his business's success or image. But he also expressed irritation with people he felt lacked concern for future generations that must deal with the consequences of today's poor environmental practices, including failure to recycle. Similarly, when asked at the end of her interview if she wanted to share anything else, Greenco's Melia Lesko condemned a rampant and wasteful consumerism that encourages families to purchase much more food than they can use. The body of committed ZWZ participants and advocates—a small minority of total Atlanta-area foodservice operations—comprises self-selected individuals with a strong environmental ethic.

The household recycling ethic goes to work

It is easy to take a dim view of corporate environmentalism, to dismiss it as a cynical public-relations ploy. Indeed, “greenwashing,” which Greenpeace (n.d.) defines as “the act of misleading consumers regarding the environmental practices of a company or the environmental benefits of a product or service,” is a real and growing problem that has prompted the U.S. Federal Trade Commission (n.d.) to seek more stringent guidelines on the environmental claims that companies can make. But it is also true that many businesses are populated with employees who, like many Americans, internalized the ethic of personal environmental responsibility that has made recycling an integral part of the modern waste management landscape.

Thus while corporate environmentalism can be deliberately opportunistic (as with greenwashing) or ineffectual in terms of substantive environmental outcomes, it is reasonable to conclude that at least some of it is sincere—if only because the individuals behind those corporate actions are sincere. The employee who initiates a business-wide recycling program is, in all likelihood, also a household resident who diligently washes out bottles and cans for curbside recycling collection. And rarely would we call this household resident insincere. As Ackerman (1997) observed, “recycling is an impressively pure form of altruism, a widespread commitment to the greater good” (p. 8).

Assumptions underlying modern recycling

What perhaps should be of more concern than greenwashing is the set of longstanding assumptions that have determined how recycling is handled in the United States and account for the personal recycling ethic noted above. A critical look at the activities and literature of, for example, the Southeast Recycling Development Council (SERDC) reveals an extraordinary presumptuousness about who is responsible for providing recycling services and infrastructure.

SERDC lists among its major activities “workshops to educate recycling officials” and “outreach to communicate with elected officials,” noting that “the work we do helps support industry in the Southeast” (SERDC, n.d.a). SERDC’s four factsheets on its website advise an unspecified audience, although it quickly becomes clear that its target is local government, on developing and improving recycling programs. Its factsheet titled “Boosting Participation for Effective Economics” anticipates a question, “how much should my community invest in outreach?,” and answers with the following condescending response:

When you invest in outreach with your public, you’re making a sound investment. How much should you consider spending? In its Recycling Professionals Certification Training Manual, South Carolina encourages communities to allocate about \$1.00 per household per year. If changes are occurring to a program, then the figure would be higher than that. If your community can’t spend that amount per household, you will need to be more creative in finding no-cost or low-cost outreach methods to get the public’s attention. (SERDC, n.d.b, p. 1-2]

SERDC is also somewhat misleading in its literature about the gains to be made from increasing recycling in a single community. In its factsheet, “Understanding Local Recycling Markets,” the council prominently cites a study by North Carolina’s RE3.org campaign which studied the net financial impacts

of increasing recycling participation by 10 percent versus increasing the market price of recyclable materials by 10 percent (SERDC, n.d.c). The study found a greater net financial improvement from the increase in participation than from the price increase, a finding that SERDC uses to urge greater participation. At no point in this eight-page factsheet does SERDC acknowledge that if all communities followed its advice and increased recycling participation, the overall supply of recyclable commodities would increase—and without a commensurate increase in demand, their market prices would fall. This is important for a community to understand if it is counting on revenue from sales of the recyclables it collects to help fund its expensive investments in recycling programs and infrastructure. As seen in the Boulder case study, this kind of supply-demand mismatch proved to be a problem.

Clearly, according to SERDC, government is wholly responsible for development of recycling collection and sorting programs. But SERDC is not the only organization demanding that government bear the burden, financial and otherwise, of recycling. This attitude is so historically ingrained that it is rarely questioned by private, public, and nonprofit sectors alike—even among entities that stand to lose financially because of it. But the audacity of this position becomes more apparent when one realizes how much recycling is more than just a service typically provided by local government.

The dual roles of recycling

Recycling occupies a unique position in material life because of the two functions it performs simultaneously: It is both a waste management service and an early stage in the manufacturing process. As the former it blends in with traditional utilities such a sewer service or curbside trash pick-up. As the rarely-acknowledged latter it is essentially raw material extraction, very much like the business of mining bauxite for aluminum or harvesting trees for paper. This is why recyclable material is often referred to as “urban ore.” Thus while household members who clean and separate their recyclables may think they are merely being environmentally virtuous citizens, they can also consider themselves to be volunteer urban mine workers who even pay (usually through their curbside trash/recycling collection bills) for the privilege of helping to provide manufacturers with valuable raw materials.

If recycling plays these two equally important roles, it is arguably unfair that it is treated almost exclusively as a government service regarding responsibility for infrastructure, collections programs, and educational outreach—but that is the norm today, and it did not happen by accident.

Harnessing a public recycling ethic for private gain

As recounted by Ackerman (1997), traditional recycling was motivated by the personal economic interests of scavengers and scrap dealers. But that changed:

What is new in contemporary municipal recycling is not only the organization of formal programs to promote it, but also the primacy of altruistic or ecologically concerned motivations: in almost all cases, modern recycling offers no personal economic benefit for participation. (p. 15)

Royte (2005) traces much of today’s consumer-based recycling ethic to the efforts of Keep America Beautiful (KAB), a campaign started in 1953 by beverage and packaging companies when littering

became a public concern soon after they introduced disposable beverage cans and marketed them as such (one advertisement actually showed people tossing empty cans in a lake). States, starting with Vermont, began to pass “bottle bills” requiring use of refillable beverage containers to reduce litter. Beverage companies opposed these laws burdening them with responsibility for their packaging.

To thwart the need for such legislation, KAB issued public service announcements including a 1971 ad famously featuring a Native American surveying a trash-strewn landscape with a tear rolling down his face (Royte, 2005). This powerful, guilt-inducing campaign helped to convince ordinary citizens that responsibility for the trash problem lay with them—not with the companies that produced and used disposable containers.⁹

As environmental concerns (including the perception of dwindling landfill space) and economic development possibilities spurred community interest in recycling in the 1980s, firms viewed it “as both a threat and an opportunity” (Weinberg et al, 2000, p. 20). “If recycling failed, firms might face mandates to reduce the amount of packaging or to reuse it. Both of these options were potentially expensive” (p. 20).

The interests behind KAB understood the potential gains of developing a recycling ethic at both the personal and community levels. Not only could it shift responsibility for packaging waste, it could also ensure a cheaper supply of raw material inputs. Weinberg et al. (2000) explain:

[The packaging industries’] encouragement was very focused on allocating responsibilities for recycling to consumers and municipalities, rather than to producers. These industries were well aware of the expenses involved in the collection and sorting of recyclables, and by promoting consumer-municipality obligations, they could evade the high costs of such processing. (p. 45)

What emerged was a recycling program model in which “private interests were quietly attended to, while public agendas were more overtly set” (Weinberg et al., 2000, p. 21). Waste hauling companies started collecting recyclables so as not to lose business on material that otherwise would have been trash (this would later have important ramifications in policy areas such as landfill bans and official waste hierarchies, as noted in the case study). Municipalities or community groups would sort the collected materials, shifting much of the cost of processing material for remanufacturing to public budgets instead of corporate. And trade associations and other industry-backed groups would maximize benefits to their members by continually encouraging recycling programs at the community level—as SERDC and its ilk do today.

This arrangement lowers firms’ material input costs. According to Weinberg et al. (2000):

Eventually, this would lead to a de facto competition among communities, allowing prices for recyclable goods to remain as low as possible. From the standpoint of recycling firms, the

⁹ This recycling ethic, grounded as it is in a long-running media message, might be uniquely American. As Kollmuss and Agyeman (2002) point out, train passengers in China have a longstanding practice of tossing their used food and beverage serviceware—much of it plastic and Styrofoam—out the train windows without minding that it litters the landscape.

aggregate of communities would ideally produce somewhat more recyclables than the market actors wanted to absorb, thus maintaining low prices and supply reserves of the 'urban ore.' (p. 21)

In short, promotion of the recycling ethic among the public allows the packaging industries to socialize the costs of recycling while privatizing the benefits. This norm explains how, in an article for *Resource Recycling*, SERDC's executive director could scold local governments for sending surplus recycling revenue to their general funds instead of using it to expand their recycling programs, asserting, "municipal accounting needs to address the problem that recycling is not supposed to be the funding source for new police cars" (Sagar, 2012, p. 17). This is rather like a warehouse insisting that its workers use their wages for gym memberships to increase their physical strength and endurance so that they can lift heavier loads and work harder for the company's benefit, instead of spending their earnings at their own discretion. There are other ways to meet the goals of recycling without disproportionately burdening individuals or local government.

6. Conclusions: Considerations for Informed Pursuit of Zero Waste

This final section contains lessons gleaned from the previous case study discussions and review of literature, presented as a set of considerations that those interested in a zero waste planning and implementation—in the private or public sphere, at any level of government—should take into account. These considerations are organized by general topic area.

The two case studies explored in this thesis suggest that much of the value of today's zero waste movement and related innovative waste-reduction efforts is that they provide another opportunity to revisit unresolved issues associated with waste-reduction movements in general. There are two such issues in particular. One is the very definition of waste, which is influenced by a variety of factors. Another is the responsibilities and capabilities of different parties—i.e., private vs. public sector, and different levels of government—to address problems relating to waste.

While the conclusions drawn from case studies must be generalizable to some degree in order to be useful, the necessarily limited nature of case study research makes their conclusions more appropriate as points of departure for more research (Gerring, 2007). Therefore, statements below that appear definitive are as much intended to stimulate dialog and debate—much in the way the term “zero waste” is intentionally provocative. Some of these conclusions, then, might also serve as hypotheses for future testing.

6.1. Origins of Today's Waste-Reduction Ethic

6.1.1. *Responsibility for waste arbitrarily resides with consumers and local government*

The Atlanta case discussion showed that the modern recycling ethic is rooted in the efforts of packaging industries to avert legislative efforts (such as bottle bills) that would hold them accountable for waste associated with their consumer products. Their use of public campaigns like Keep America Beautiful and encouragement of local government investment in recycling infrastructure (which organizations like SERDC continue today) effectively transferred responsibility for recycling to citizens and government. The ensuing proliferation of municipal recycling programs also guaranteed the packaging industry a cheap, abundant supply of material inputs. The ever-present availability of cheap virgin plastic and absence of mandates for recycled content in packaging make it more difficult for municipal MRFs to recoup the costs of processing from sales of this material.

As much as zero waste advocates profess the need for producer responsibility (e.g., as outlined in Eric Lombardi's five tenets of zero waste), most action to reduce waste in the United States today still focuses on individuals, households, and local governments. Even the businesses that are targeted in

such appeals are smaller and service-oriented (for example, restaurants and hotels targeted by Atlanta's zero waste zones) rather than major producers such as packaging companies or car manufacturers. As found in the Atlanta case discussion, many business owners and employees are individuals who have internalized the ethic of personal responsibility for recycling, which accounts for their embrace of zero waste even when the economic benefits of doing so are negligible.

The power of this highly-targeted and historically-ingrained recycling ethic is that it is now second nature among a wide swath of the American population, making it difficult for many to conceive of waste beyond household trash. The continued focus on downstream waste, even among many zero waste efforts, suggests that waste-reduction advocates might not fully appreciate that this ethic skews their work away from producers and also from other less conventionally-defined sources of waste. (This is not to say that consumers or local government should have no role in materials management. Even in Japan's highly-developed EPR system, consumers are a critical part of making sure materials remain within a closed-loop cycle.)

6.2. Defining Waste

6.2.1. *The definition of waste determines priorities and impacts of zero waste efforts*

"Waste" most often brings to mind downstream solid waste, the used-up and discarded components of municipal solid waste (MSW). This is a direct result of the history discussed above. But there are more significant sources with greater impacts: industrial, agricultural, and energy inefficiency of buildings and transportation. Zero waste advocates in the case studies generally did not concern themselves with these more important sources, continuing to focus concrete action on MSW even as their guiding principles (e.g., in ZW resolutions or Eric Lombardi's five tenets) acknowledge the need for producer responsibility. It should be noted, however, that in the Atlanta case, some interviewees described zero waste as the "low-hanging fruit" and said that they planned to seek additional environmentally-responsible changes (e.g., energy efficiency) in their own operations and on a broader community scale.

The issue of producer-generated waste might become more relevant soon, since there is evidence that manufacturing is returning to the United States (Fishman, 2012; Benes, 2009). This shift will mean more than just a change in economic activity on American soil; it necessarily will be a highly material change as well, with a good deal more physical inputs transforming into useful goods and also waste—specifically, industrial waste. Industrial waste is the forgotten frontier of waste management in the United States. A manufacturing renaissance in this country would seem to give zero-waste advocates all the more reason to seek policy at the state or federal level to encourage a cradle-to-cradle, producer-responsibility ethic in manufacturing.

Other significant forms of producer-generated waste that currently receive little attention in the zero waste community are wastes associated with energy-inefficient buildings and transportation, conventional agricultural operations, and mining. If the zero waste movement is truly concerned with the environmental and social impacts of waste, it should consider broadening its definitions and

concerns to address more significant forms of waste beyond MSW. Such action could strengthen the zero waste movement's image as well as impacts.

6.3. Roles of Different Sectors in Zero Waste

6.3.1. *The private, public, and nonprofit sectors each make important contributions to waste reduction*

Public and private sectors are often portrayed as occupying distinctly separate spheres in society, well-defined and often antagonistic: The private sector drives innovation, produces wealth, but generally detests regulation, and the public sector is the guardian of the public interest but inefficient and ineffective. As illustrated by the case studies, these characterizations are caricatures and the truth is more nuanced.

Private firms can fight regulation (big waste companies owning landfills whose profitability was threatened by the state bans on yard waste in landfills, as explained in the Atlanta case) or embrace regulation (Western Disposal in the Boulder case). The Porter Hypothesis argues that well-designed regulation can both help meet publicly-defined environmental goals and advantage companies who profit by innovating in response. Western Disposal certainly has thrived under Boulder's system of materials management regulation.

The public sector can and often does intervene in irrational or ineffective ways—and this feeds the negative perception of government, as evidenced by comments noted in the Atlanta case study by zero waste advocates suggesting that local government is hapless and beleaguered. But as the same case shows, when zero waste advocates sought widespread composting practice, they worked to insert language in the local government's RFP for airport concessions—an act of government intervention. Similarly, the Boulder case explained how major changes in the paper recycling industry came about through a federal minimum-content standard.

Thus, in some respects, sectoral divisions are artificial; public and private sectors alike have the capacity to use and abuse power, and both offer tools useful for serving both narrow and broad interests—although, again, what constitutes “in the public interest” is subject to debate and change over time.

Another sector deserves attention: the nonprofit. In both case studies, nonprofits (Eco-Cycle in Boulder, the Green Foodservice Alliance and later Elemental Impact in Atlanta) provided the initial ideas, resources, and drive for waste-reduction activity in their communities. In both cases this activity would lead to some form of government intervention and certain private-sector firm would adapt and benefit. Thus nonprofits act as catalysts for action and interaction of other actors, and display qualities of both public and private.

As noted in the Atlanta case discussion, a theoretical concern might be that nonprofits work toward goals that they define as in the public interest—but they are not accountable to the public, and their

planning efforts, which are not formalized in legislation or other public mandate, can be easily swayed or stymied by personality conflicts.

The L³C business model—the low-profit limited liability company with the dual bottom line discussed in the Boulder case—can be viewed as a way to formally meld public, private, and non-profit-sector interests. This model combines the best features of for-profit and nonprofit models to create a hybrid enterprise with the capacity to innovate and contribute to economic growth while maintaining some responsibility for meeting public-interest goals.

6.4. Roles of Different Levels of Government in Zero Waste

6.4.1. *Local government should not bear the burden of materials management alone*

Communities control land use and infrastructure construction decisions that shape material disposal and recovery systems. At the same time, as explained in the Boulder case study, many communities lack control over certain aspects of materials management—for example, flow control, landfill tipping fees, and demand for recovered materials—that can hinder their efforts. Zero waste advocates and local governments need to be aware that all such factors can affect their plans. It is not enough that local officials simply heed their constituencies' desire for more recycling; they must understand how seemingly-isolated decisions they may make are in fact multiplied across many other localities with similar imperatives, producing an aggregate effect that can yield unintended consequences. The Boulder case in particular detailed the severe drops in market prices for recyclables due largely to the influx of municipal recycling programs across the country and the lack of policy to significantly increase demand for recovered material. The proliferation of recycling programs across the United States seems to have encouraged the belief that materials management should remain exclusively the responsibility of local government in this country. Groups like SERDC continue to reinforce that notion today.

Many local governments have internalized the packaging industry's historical insistence that municipalities and individuals bear most responsibility for materials management. Until local governments recognize that this is arbitrary, and organize to seek policies at upper reaches of government to lift some of that burden, it is unlikely that a zero waste system with any durability can develop.¹⁰

¹⁰ This ultimately self-defeating sense of independence seems to be a general problem among local governments. As a *New York Times* series reported in 2012, local governments very commonly use economic incentives to attract companies, but more often than not any benefits are short-lived and their economies and jobs suffer over the long term. As one interviewee for the series observed, "These economic development deals with a company just serve to guarantee that the nation's largest companies can receive tax breaks wherever they go" (Story, 2012). If communities are routinely hurt by this kind of activity, this suggests that they should organize and lobby for changes in policy at the state or federal level that can offer some kind of protection—yet they do not. Similarly, a trend among local governments is climate action planning to reduce their communities' contributions to GHGs (to be clear, climate change mitigation planning is a separate matter and logically rooted at the local level). These efforts require significant planning resources but seem to be of dubious value since there is no guarantee that all communities will independently adopt plans sufficient to produce a widespread effect. However, action at the

6.4.2. *State and federal government can offer useful policy tools to achieve zero waste*

Both cases demonstrate that action and inaction at the state and federal levels were just as important determinants of the success of zero waste efforts as the local factors. Policy tools such as state-level mandates for minimum recycled-content standards (described in the Boulder case), state bans on certain materials in landfills (detailed in the Atlanta case), and state legislation to establish alternative models of enterprise (like the L³C for-profit/nonprofit hybrid business model) all have potential to improve material recovery. Zero waste advocates should familiarize themselves with the possible opportunities available if they can access such tools at the upper reaches of government.

But they will have to ask for it, because clearly the federal government is unlikely to take the initiative on materials management. As shown in the case studies, with the EPA's limited facilitating and encouraging role consisting mainly of compiling and distributing information on others' waste-reduction projects and offering awards for waste-related innovation, the federal government is not making materials management a priority. There is potential for strengthening the EPA's role and engaging other federal agencies. Indeed, a report issued by the Government Accountability Office (2006) found that the Commerce Department has been quietly ignoring its responsibility, written into the Resource Conservation and Recovery Act (RCRA) no less, to stimulate market development for recycled materials.

There remains a fundamental disconnect between the producer-responsibility intentions of local government ZW resolutions and strategic plans, and the ability of local-level policy and action to achieve it. Boulder's zero waste resolutions declare the necessity of producer responsibility. San Francisco's zero waste website provides examples of ordinances supporting producer responsibility. But this kind of local action can be merely token because a single locality has very little real ability to change manufacturing and materials-management practices of major producers or responsibility. Only action at the state or national level can achieve significant EPR—as demonstrated in other countries like Germany and Japan. As well-intentioned as local zero waste efforts are, their proliferation may be somewhat damaging to their cause because it feeds the notion that significant change can be achieved at that level. Zero-waste advocates should recognize that that their efforts can be far more efficient and effective if they organize to demand state and national action.

6.5. Questions for Further Research

Following are questions that would be useful to explore in future research related to zero waste:

- What would be the estimated environmental, economic, and social impacts (e.g., in terms of GHG emissions averted, water pollution avoided, costs to local governments, etc.), of zero waste as currently practiced (with its focus on MSW) if a significant number of communities beyond

federal level such as a carbon tax has a much greater reach and thus may be a more efficient, effective means to the end. If there is as little time to waste in the climate change battle as prevailing scientific opinion claims there is, this important public need should not be left to the well-intentioned but sparse and uncoordinated efforts of local government.

today's early experimenters adopted such practices? How do these impacts compare with other environmentally-focused efforts such as increasing building energy efficiency or use of public transportation?

- What specific challenges and opportunities does the U.S. system of federalism (distributed sovereignty among different levels of government) present for the most effective pursuit of meaningful zero waste? What specific state and federal policy tools should be engaged to complement local efforts?
- How can a system of producer responsibility be designed such that producers would not be able to simply pass on all costs to the consumer? How have other countries with PR systems dealt with this issue?

Appendix A: Case Study Interviewees

CASE STUDY 1: BOULDER, COLORADO		
Name	Title and Affiliation	Date of Interview
Jeff Callahan	Manager Boulder County Resource Conservation Division	2/9/12
Bryce Isaacson	Vice President, Sales and Marketing Western Disposal	1/13/12
Eric Lombardi	Executive Director Eco-Cycle	1/16/12, 1/24/12
Kara Mertz	Local Environmental Action Manager City of Boulder	2/6/12
CASE STUDY 2: ATLANTA, GEORGIA		
Name	Title and Affiliation	Date of Interview
Jimmy Chancellor	Executive Steward Hyatt Regency Atlanta	10/28/11
Randy Childers	Senior Director of Engineering Hyatt Regency Atlanta	9/30/11
Holly Elmore	CEO Elemental Impact	1/1/12
Dan Hourigan	Director, Transportation and Sustainability Midtown Alliance	10/13/11
Melia Lesko	Vice President Greenco Environmental, LLC	12/1/11
Steve Simon	Partner Fifth Group Restaurants	10/19/11
Tim Trefzer	Sustainability Coordinator Georgia World Congress Authority	12/9/11

Appendix B: Sample Interview Questions

Note: The interviews for this thesis were unstructured. The author approached each interview with a set of general questions and usually additional questions tailored to an interviewee's unique occupation and/or case study location. In addition, interviewees were allowed to take the conversation in any relevant direction they desired, which often prompted the author to ask new questions. The questions below represent the typical core set asked in each interview (in this case, for the Atlanta case study).

1. What are your goals in adopting a zero waste approach? How do they rank in importance? Have these goals evolved over time?
2. How has participation in zero waste efforts affected your business operations?
3. How do you think zero waste has affected the broader community?
4. What metrics, if any, do you use to measure the progress of zero waste efforts?
5. What were the major challenges (fiscal, economic, legal, intergovernmental, political, cultural) you encountered, and how did you resolved them? What challenges are you still facing?
6. Which organizations, institutions, and/or persons do you consider to be the most influential in development and implementation of zero waste in Atlanta?
7. What factors do you consider to be responsible for the success of this particular zero waste effort?
8. What factors do you think have hindered the success of this zero waste effort?
9. What policies, if any, at the state and/or federal level do you think would facilitate zero waste?
10. Is there anything else related to the zero waste effort that you would like to share?

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