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The Effect of Consumerism and Regulation on Household Solid Waste Management in The United States and Germany: A Comparative Study

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THE EFFECT OF CONSUMERISM AND REGULATION ON HOUSEHOLD SOLID WASTE MANAGEMENT IN THE UNITED STATES AND GERMANY:
A COMPARATIVE STUDY

By

Amir Vafa

A THESIS

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Private household recycling is a significant aspect of consumerism in economically developed countries and the inevitable question of household waste management has gained more importance among municipalities in recent years. The present study examined the effect of regulation on household solid waste management. Within a comparative, qualitative framework, the study explored and evaluated the pro-regulatory effects in Germany and the anti-regulatory policies in the United States by means of comparing two similar communities, Lincoln, Nebraska and Augsburg, Germany. By examining the present legislations, official documents, legal and operational procedures, and other relevant artifacts, laws, regulations and the degree of their success are analyzed. The second major element of the study is consumerism, as a phenomenon inherent to industrialized societies. After examining the relationship between regulations and consumption, the results show that a pro-regulatory policy, in the case of Germany, is more sustainable. The results of this study may be valuable for future research, municipal policy makers, recycling program managers, and other interested stakeholders.
Acknowledgments

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Amir Vafa
To my Mother,

Soraya Amirbagheri
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Definitions, Terms, and Acronyms

Durable Goods:

Durable goods generally are defined as products having a lifetime of three years or more, although there are some exceptions. In this report, durable goods include large and small appliances, furniture and furnishings, carpets and rugs, rubber tires, lead-acid automotive batteries, consumer electronics, and other miscellaneous durable goods (e.g., luggage, sporting goods, miscellaneous household goods) (USEPA, 2007a).

USEPA: United States Environmental Protection Agency

GHG: Greenhouse Gas Emissions

MSW: Municipal Solid Waste. According to the USEPA, it does not include construction and demolition debris, bio-solids (sewage sludge), industrial process wastes, or a number of other wastes that, in some cases, may go to a municipal waste landfill. German resources use the approximately the same definition. In both concepts address several of these materials separately.

NDEQ: Nebraska Department of Environmental Quality

NEEPA: Nebraska Environmental Protection Act

RCRA: Resource Conservation and Recovery Act of 1976

Solid Waste: Garbage, refuse, sludge, and other discarded solid materials, including solid waste materials resulting from industrial, commercial, and agricultural operations, and from community activities, but does not include solid or dissolved materials in domestic sewage or other significant pollutants in water resources, such as silt, dissolved or suspended solids in industrial wastewater effluents, dissolved materials in irrigation return flows or other common water pollutants. The classification of waste and its disposal is often confusing. Many toxic wastes, including industrial (residual), incinerator ash, asbestos, etc. are disposed in "municipal" landfills.

Residential Solid Waste: Wastes generated but the normal activities of households including, but not limited to, food wastes, rubbish, ashes, and bulky wastes.

Source Reduction:

Reduction and reuse of municipal solid waste; the material never enters the waste stream (USEPA, 2007a).
CHAPTER 1

Introduction

Environmentalism and the search for a sustainable earth have come a long way in the Western hemisphere. One aspect of the recent research on pro-environmental behavior is the notion of “sustainable consumption” (Heap & Kent, 2000; OECD, 1997). Based on this notion, over-consumption and life-style are the primary determinants of environmentally unsustainable being. One inevitable outcome of households’ consumption is the generation of Municipal Solid Waste (MSW), the garbage. Anthropogenic environmental problems are exacerbated and serious issues such as global warming and climate change have increasingly captured public attention during the past 20 years. Among other global environmental problems, household recycling and its associated regulatory policies, as well as individuals’ consumptive behavior toward it, have become important topics for most stakeholders.

Several factors influence people’s recycling behavior. Two fundamental avenues exist within the extensive social science literature; the socio-psychological, and the economic approach. The former addresses issues relevant to individuals’ motives, norms, attitudes, intentions, and behavior (e.g. Gamba & Oskamp, 1994) and the latter is focused on topics such as cost-benefit analysis (e.g. Miranda & Adly, 1996) as an important element of the Western utilitarianism, or market based instruments (Baumol & Oates 1988). Furthermore, exploring and comparing the effects of decision-making and the regulatory instruments in different cultural settings within the Western hemisphere and the interconnectedness to consumerism is relatively an unexplored area. The present

1 In the present study, the term “over-consumption” is not related to over-population; it relates merely to the high consumption rates in industrialized democracies such as the US or Germany..
study examined the eventual “success” of the mentioned approaches to waste management programs.

Two cities, Augsburg in Germany and Lincoln in Nebraska, USA are compared in a qualitative study. Through the evaluation of laws and regulations in both countries, and building on valuable previous research on consumerism and the position of regulations, this study explores the effect of consumption attitudes on household waste. The central question that arises, is, how does regulatory policy impact private households recycling in societies with a pro-consumption attitude and what are the effects of such policy on the amount of the recycled waste?

Following a general information and background section, previous research is reviewed and in the methods section, the data and information inquiry measures are described. Within the discussion and conclusions section, new insights and findings of this study are presented.

The comparative nature of the present study may be of value for policy makers in the state of Nebraska, as well as for the authorities in Augsburg; in addition, it might encourage further research in comparing the stance of other European countries with the U.S. on this topic.

*Background of the Problem*

*The United States*

*The Conservation Movement.* The conservationist character of the U.S. environmental movement has its roots in the 1800s and perhaps the publication of “Man and Nature” (Marsh, 1965) from George Perkins Marsh in 1864, who introduced terms such as environmental degradation, or deforestation. The “Progressive Era,” from 1890s
to the 1920s made conservation a national issue and the 1950s, 1960s and 1970s were the decades of environmental awareness and the transition from a mere conservationist approach to the realm of political ecology. Those were the years of advocates such as Aldo Leopold, Rachel Carson, and Paul R. Ehrlich. Issues such as air and water pollution, solid waste disposal, pesticide poisoning, and other environmental problems departed from the academic arena and reached the public. The 1970s was the era of extensive legislation; Clean Air Act (1970); National Environmental Protection Act (1970), leading to the establishment of the United States Environmental Protection Agency and the Council on Environmental Quality; the Endangered Species Act (1973); the Resource Conservation and Recovery Act (RCRA) (1976); the Superfund Act (1980); and the Pollution Prevention Act (1990) are some examples. A wide range of organizations at local and national levels, with their respective interests, represents the environmental movement in the Unites States. A unified political voice, however, has not been fomented. The Green Party USA, “The Greens,” for example, has remained as a grassroots organization and has little political power on either the state or federal level.

*The Federal Law and USEPA Regulations.* The USEPA began its operation on December 2, 1970, with reducing pollution as a central motive for its birth. As the most important law enforcement agency for national environmental laws, it encourages governments, companies and others to meet their environmental obligations. The USEPA’s “Strategic Goal” is “to preserve and restore the land by using innovative waste management practices and cleaning up contaminated properties to reduce risks posed by releases of harmful substances” (USEPA, 2009b). The growing volume of municipal waste prompted the U.S. Congress to enact the Resource Conservation and Recovery Act
(RCRA) in 1976; it is the principal federal law in the United States regarding solid waste. The important Hazardous and Solid Waste Amendments of 1984 (HSWA) expanded the scope and requirements of RCRA. Energy conservation, as well as waste reduction and management are the main emphasis points of this act. The act addresses these issues in subtitle D, 11 categories of waste (USEPA, 2009a).

In general, RCRA’s central mandate requires USEPA to develop standards to protect the environment; however, the USEPA defines what these standards are. The process of issuing a regulation consists of six phases: 1) commencing the activity (the agency sees the need for a regulatory activity), 2) analyzing the problem, 3) identifying the options, 4) publishing the proposal in the Federal Register and requesting public comments, 5) reviewing public comments, 6) issuing the regulation (USEPA, 2009d). Environmental regulations are mainly in Title 40 of the Code of Federal Regulations. Chapter I, Subchapter I, parts 239 to 282 contains solid wastes regulations. With regard to municipal solid waste, part 246.100 mentions the non-mandatory nature of the requirements for regional and local governments (USEPA, 2009e).

The City of Lincoln, General Information. The former city of Lancaster, founded in 1856, Lincoln is the capital of the state of Nebraska since 1867. Originally laid out near Salt Creek and the flat saline wetlands of northern Lancaster County, Lincoln has developed rapidly in recent decades. The city’s metropolitan area consists of Lancaster County and Seward County (since 2003). The mayor, as the chief executive officer, and a seven-member city council comprise the strong mayor-council government of the city. Lincoln’s economy is typical of a mid-sized American city; service industries are the most active economic branch in Lincoln. Lincoln has four broadcast television stations
and the headquarters of Nebraska Educational Telecommunications, which is affiliated with the Public Broadcasting Service, National Public Radio, and Public Radio International, is located in Lincoln. The City has eight colleges and universities and the University of Nebraska-Lincoln (UNL) as the flagship campus, together with the state government, are both playing a major role in Lincoln’s economy. Medical, banking, information technology, call centers, insurance, and education are some prominent industries in Lincoln.

*The City of Lincoln, General Waste Management Information.* Initially located in the Economic Development Division of the Mayor’s Office, the Lincoln Recycling Office was created in 1987. Its creation coincided with the development of a new sanitary landfill. The mission of the Recycling Office is to divert waste from the sanitary landfill in an economically and environmentally sound manner in full partnership with the private sector (InterLinc, 2009a). In addition to residual waste collection, there are five privately owned curbside recyclers in Lincoln (InterLinc, 2009b). Twenty-seven public drop-off sites in Lincoln are spread around the city. There are 22 private recycling centers in Lincoln (InterLinc, 2009c). The city has one landfill, and over 800 tons of waste is disposed of in Lincoln’s Bluff Road Landfill every day (InterLinc, 2009d).

*Germany*

*The Environmental Movement.* The long history of the environmental movement in Germany is inseparable from the history of the German Green Party (GGP). Furthermore, the history of the latter is indeed a result of decades of struggle for justice and freedom after World War II. The post war generation in Germany sought a counterculture, free of “State Authority,” coercion, and consumption (Schuberl, 2000).
The “non-parliamentary” opposition became a major pillar in the 1960s and Petra Kelly, the founder of the GGP, was instrumental in that effort. Kelly’s, and the party’s, approach to politics was based on the concept of “anti-party party;” a party that is natural and common to all, is shared by all, and used by all for all (Kelly, 1994). During their 8 years of active government participation (1998-2006), the Greens passed and implemented environmental laws and regulations mostly based on their own concepts and ideals, for which party members had individually been fighting for on the streets and elsewhere during the 1970s and since their party’s official foundation in 1980. Therefore, it is clear that laws such as “the Federal Waste Management Law” of 1990, as an amendment to the “Waste Disposal Law” of 1971, or the “Law of Promotion of Circular Flow Economy” of 1996, accompanied with seven other laws, are some of the Greens’ major achievements during their non-governmental activities and before their election in 1998. The present awareness in pro-environmental behavior within the population is understandable, if one considers the extensive history of the environmental movement in Germany during the 1960s and 1970s (Dominick III, 1992).

*The Federal and the State Government.* The administrative and executive role of the “Green” party in the German federal government becomes more important, if one considers two important factors; 1) the central government in Germany is the primary body determining environmental legislation since the late 1960s, and 2) although in a federal system, the state governments have limited legislation authority. The functions that the state governments exercise include schooling, internal security, and the organization of local self-government. This “Unitarian” character of the German state

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2 A term introduced by German “Greens” in the 1970s, implying the opposition to the government and at the same time the influential character of “Green” ideas in the society.
implies a more or less centralized legislation system, which makes the German Federalism a special case. Consequently, almost all environmental laws in the state of Bavaria, the state government of Augsburg, are substantially, federal laws with minor adaptations.

*The State of Bavaria.* The city of Augsburg is located in the state of Bavaria, south Germany. The “Bavarian State Agency for Environment” is the responsible department for all the environmentally relevant enforcement measures in the state of Bavaria. The “Bavarian Waste Management Law,” passed in 1991, is in full compliance with the federal law. The first section describes the four important goals of the law. The four goals are: 1) Waste prevention through waste reduction; 2) minimizing hazardous waste; 3) “circular” waste disposal management that requires the return of materials such as paper, glass, or metals back in to the production activity; and 4) waste treatment (recycling before landfilling).

One feature of this law is the preparation of an annual “Waste Balance Sheet” that includes the sort of waste, the origin, and the amount. The overall goal is to reach the premises of circular management; (the “throughput” discussion in the field of Ecological Economics).

*The city of Augsburg.* Founded in 15 B.C., Augsburg is Germany’s second oldest city after Trier and the third largest city in the state of Bavaria, in southern Germany. The city and the surrounding region played a considerable Europe-wide role during Renaissance (14th-16th century), Rococo (18th century), and industrialization (19th century). Augsburg is a college town and home of Rudolf Diesel the inventor of diesel motor, Mozart’s father, Leopold, and the writer Berthold Brecht. With two universities, a
7.2% population growth rate since 1987, and numerous important companies, it has become a vibrant industrial city and, due to its proximity to Munich (30 miles), it has gained more importance in recent decades. Situated in a beautiful landscape in Bavaria, a wealth of historical treasures, attractive cultural and leisure activities, and one of the lowest crime rates in Germany, Augsburg offers a cosmopolitan ambience and, despite all the possibilities of a metropolitan city, it remains traditional. Dayton, Ohio is one of Augsburg’s partner cities, since 1968.

The city has three direct and indirect elected representatives to the German Bundestag. The city council consists of 60 honorary members representing seven political parties, and the Mayor, as the chief executive officer, is the Chairman of the council. The council members are elected by the people; voter participation in the 2008 local election was 47.6%. The council’s decision-making and executing entities are the 14 “expert committees”, and the Environmental Committee, in cooperation with the Committee on Public Order and Health, are responsible for the city’s waste management policy. The Environmental Office is the enforcement authority for municipal solid waste management in Augsburg. The fundamental legal basis is the Law of Circular Flow Economy of 1996 (MOJ, 2009a) and subsequent legislative requirements.

Waste Management in Augsburg. Founded in 1908 as “Office of Municipal Street Sanitation” (aws, 2008), “The office of Waste Management” in Augsburg has introduced and established eight household waste categories. In 2007, residual waste accounted for nearly 44% (41,484 tons) of the entire household waste; a decrease of 7.6% compared with 2004 (aws, 2007). Although the decline in population rate (-5%) between 2004 and 2007 is greater than the rate of decrease in total waste (-0.43%) (see Table 1), there has

3 Lower House of German Parliament
been an increase in the state wide recyclable fraction of the generated waste, or “Potential Recyclable Material”\textsuperscript{4} during the same period (BOE, 2007, p. 73, Table 35), that can be applied to the Augsburg’s numbers. In addition, the number of potentially unregistered population in Augsburg’s households may contribute to this statistical inconsistency. The city has four drop-off sites (aws, 2009c) and one landfill facility (aws, 2009).

Table 1. Household solid waste generation in Augsburg in tons (aws, 2009).

<table>
<thead>
<tr>
<th>Year</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual Waste</td>
<td>44,648</td>
<td>41,160</td>
<td>42,049</td>
<td>41,484</td>
</tr>
<tr>
<td>Bio-Waste</td>
<td>21,389</td>
<td>21,234</td>
<td>21,428</td>
<td>22,157</td>
</tr>
<tr>
<td>Paper</td>
<td>21,701</td>
<td>22,392</td>
<td>22,576</td>
<td>22,756</td>
</tr>
<tr>
<td>Scrap Metals</td>
<td>491</td>
<td>433</td>
<td>334</td>
<td>296</td>
</tr>
<tr>
<td>Wood</td>
<td>3,437</td>
<td>3,739</td>
<td>4,056</td>
<td>4,453</td>
</tr>
<tr>
<td>Carpet</td>
<td>200</td>
<td>170</td>
<td>151</td>
<td>223</td>
</tr>
<tr>
<td>Bulky Waste</td>
<td>2,410</td>
<td>2,856</td>
<td>2,301</td>
<td>2,115</td>
</tr>
<tr>
<td>E-Waste</td>
<td>603</td>
<td>714</td>
<td>875</td>
<td>981</td>
</tr>
<tr>
<td>Total</td>
<td>94,879</td>
<td>92,698</td>
<td>93,770</td>
<td>94,465</td>
</tr>
<tr>
<td>Population</td>
<td>275,433</td>
<td>269,449</td>
<td>262,443</td>
<td>262,300</td>
</tr>
</tbody>
</table>

Inspired by federal law and according to the specific waste management concept of the city, waste prevention, the concept of “product responsibility” (MOJ, 2009b), and the “circular flow” principle, as a general guide, are some of the most important premises in the city’s philosophy toward waste management (aws, 2009b). For instance, the concept of “near-household-disposal” is practiced to reduce the structural constraints (Castro, 2008) such as “inconvenience” for individuals. In this concept, neighborhood containers are placed throughout the city, so that everyone can dispose her/his separated waste in four different containers (paper, plastic, glass, aluminum). The second policy

\textsuperscript{4} The word “Wertstoff” is used in Germany’s waste management official publications that can be translated as “Potential Recyclable Material.”
instrument in implementing the federal law is the “Packaging Regulation” of 1991, inspired from the concept of “Product Responsibility.” This regulation binds the manufacturer and distributors to design their products so that by production and subsequent use, the generation of waste is reduced and the environmentally sound recovery and disposal is guaranteed; in addition, to cooperate with the respective city and state governments in its disposal (BMU 2009).

The public sector, the government, is the principle actor responsible for household waste management in general. The private sector is more concentrated on industrial waste management based on the federal law (MOJ, 2009c). Furthermore, different sectors in agriculture, industry, and consumer services may build agencies through their respective chambers, in order to maintain waste management in their fields.

In accordance with the concept of “product responsibility,” the “return policy” is another aspect of the circular flow law (MOJ, 2009d). In general, it is the manufacturers’ obligation to accept a used dishwasher or television, and maintain the appropriate recycling form according to the law. The idea has led manufacturers to consider the production of more “green” products with regard to consumer demand (Kammerer, 2009).

In summary, Germany’s “polluter pays” philosophy has led to the enactment of the Packaging Ordinance of 1991. In this concept, those who produce waste are responsible for its recycling and disposal. These regulatory arrangements limit the use of packages and, therefore, “reduce[s] the production of waste at the very source” (Buclet & Godard, 2001). The national priority in Germany is prevention, material reuse, material recycling, incineration with energy recovery, and landfilling; a lower-level solution in the
hierarchy can be used only if higher-level ones are not available in practice. The regulation requires the industry to recycle the packaging first; “the use of incineration with energy recovery is a valid option if, and only if, recycling targets have already been met” (DSD, 1995, cited in Buclet and Godard, 2001, p. 308). This regulatory policy has a direct and positive effect on the amount of generated household solid waste. The Packaging Ordinance has largely contributed to Germany’s decreasing total, and per capita waste generation since 1996 (See Figure 9 and 10), including a 99 percent recovery quote for paper, cardboard, and paperboard container in 2005 (BMU, 2007); this policy has disburdened local governments since they are not responsible for recovery of this portion of generated waste, thus, no enforcement obligations.

Furthermore, the consequent legislation in the case of Germany provides transparency at all European, national, and local levels; the priority is as follows: 1) The European Parliament and the European council’s directive on packaging and packaging waste, 2) the German Circular Flow and Packaging Ordinance, 3) Bavarian Waste Management Law, 4) Augsburg’s Waste Management Statutes. It is important to note that in Germany all local governments are required to follow the federal waste management laws and regulations.

In the US, Congress enacts an environmental law (e.g. RCRA) which mandates the USEPA to develop environmental standards and regulations. The USEPA publishes the approved regulations in Code of Federal Register. In the case of waste management, the regulations in Title 40, chapter I, subchapter I, part 246B (“requirements”), are only mandatory for federal agencies and not for regional and local governments; in addition, there exists no explicit household solid waste regulation in CFR Title 40. One of the
consequences of this inconsistency is that the burden of regulation transfers to local
governments’ shoulders, i.e. taxpayers at the local and state level.

Statement of the Problem

High Consumption rates, such as in the US and Germany (Table 1), in the absence
of a sound household solid waste management policy is not sustainable. Stringent
regulations, as well as their commensurate enforcement may have a positive effect on
households’ solid waste recycling management. Both elements are absent in the
management of household solid waste in the United States.

Purpose Statement

The purpose of this comparative study is to: a) briefly describe the present
environmental laws and regulations in the area of household solid waste management in
the United States and Germany; b) explain the necessity of regulation and the economic
aspects of it; c) identify the relationships between regulation, consumerism, and the
amount of the recycled material; and d) compare Lincoln, Nebraska and Augsburg,
Germany in this regard.

Research Questions

The central question in this study is, how do regulatory policies affect household
recycling in a community with less than a 300,000 population in the US and Germany.
The study attempts to explore whether there is a relationship between regulations,
consumerism, and the amount of recycled household solid waste. These and other
emerging questions will clarify the unknown and enhance the practical aspect of the
present study.
Limitations of the Study

The focus of this inquiry is the single-family household. Apartment dwellers are not included in the study, as due to ownership and space availability issues that occur in case of curbside recycling. The private sector is not considered, due to; 1) the business character of the population, and 2) the existence of hazardous waste as a result of their business activities.

The connection between the European Union regulations and ordinances is not considered in the present study; this observation requires a separate and more specific research. Furthermore, the study does not include certain policy instruments such as deposit refund systems. These instruments cannot serve as a measure for household recycling, since retail and other privately owned businesses (gas stations, grocery stores etc.) are, in some US States, the main entities that must deal with this policy (e.g. California).

Electronic waste recycling, i.e. recycling of obsolete or broken electrical or electronic devices, is another arena that is not analyzed in this study. This area is not regulated and due to its voluntary nature, especially on the manufacturer side, cannot be included in the present work, albeit the need for further research and stricter regulation in this field. Furthermore, the topic of material recovery- facilities and processing is beyond the scope of the present study; for the commercial nature of this topic requires a separate specific research.

Significance of the Study

In investigating the human dimensions of a sustainable household solid waste management, two major ideas are implemented in the present study. First, the
comparative nature of this research; the spirit of federal laws and regulations in Germany can be observed at the local level. This is not the case in the United States, due to certain historical, political, and cultural characteristics of the U.S. society. Second, the study scrutinizes the mere economic approach in the United States, as far as global environmental problems are concerned. The importance of federal regulations is shown, and market deficiencies – failures – are described.
CHAPTER 2

Literature Review

Addressing human-induced climate change as a priority issue is one of the most discussed topics within and among governments, especially the Organization for Economic Co-operation and Development (OECD) countries (OECD, 2009), albeit the discussion concerning the legitimacy of the anthropogenic aspects continues. Municipal Solid Waste (MSW) management in direct connection with household consumption is ultimately and ideally a tool for reducing carbon dioxide emissions that promote global warming and ocean acidification (Kleypas, Feely, Fabry, Langdon, Sabine, & Robbins, 2006).

The number of landfills in the U.S. has increased between 2004 (1654) and 2006 (1,831) (Arsova, Van Haaren, Goldstein, Kaufman, & Themelis, 2008), despite the unsustainable nature of this policy that has been emphasized by numerous international entities (e.g. WCED, 1987). Stakeholders, including policy makers, should revise policies, develop alternatives, and design the appropriate enforcement measures. For instance, due to regulatory reporting requirements for landfills and Waste-To-Energy facilities (Arsova et al., 2008), relatively precise information exists that can be utilized for research and policy purposes. The same reporting requirements for all recycling programs such as curbside, or drop-off, would be of great help in designing policy.

Two major characteristics within research are notable. The first view delves mainly into the “late stage” of consumption (e.g. Lavee, 2007), the recycling of purchased products; and in the second approach, the majority of the analyzed literature
concentrates on the economic “efficiency” of household solid waste management within the traditional free-market economy (e.g. Miranda et al., 1994).

A substantive body of research on household recycling has emerged in recent years. The major streams of thinking identified for the present study are consumerism, and laws and regulations; other approaches however, such as environmental psychology, the economics of recycling, and sustainability issues are merely briefly introduced. This literature review describes the mentioned approaches with stronger emphasis on consumerism and regulations.

The U.S. and Germany are among the top ranking industrialized countries in several categories. The increase in the annual per capita waste generation in the US, from 3.61 Kg in 2006 to 3.83 Kg in 2008 (Arsova et al., 2008) as well as the international private consumption rankings (table 2) are relatively suitable indicators to demonstrate increased consumption rates. Since an increase in consumption rate in Germany is also observable (see Figure 11, p. 53), examining different laws and their monitoring and enforcement measures, policies, and the amount of generated, and recycled, household solid waste, and the potential relationship between these elements, in both democracies, remains a major pillar of the present study.
Table 2. Comparative private consumption data for US and Germany.

<table>
<thead>
<tr>
<th></th>
<th>U.S.A.</th>
<th>Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Oil</strong>¹⁵</td>
<td>20,680</td>
<td>2,456</td>
</tr>
<tr>
<td>Rank²</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>per capita³</td>
<td>68.672</td>
<td>29.805</td>
</tr>
<tr>
<td>Rank⁴</td>
<td>23</td>
<td>58</td>
</tr>
<tr>
<td><strong>Electricity</strong>⁵⁺⁶</td>
<td>3892</td>
<td>549.1</td>
</tr>
<tr>
<td>Rank</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>per capita⁴</td>
<td>12,924</td>
<td>6,662</td>
</tr>
<tr>
<td>Rank</td>
<td>9</td>
<td>35</td>
</tr>
<tr>
<td><strong>Coal</strong>⁸</td>
<td>1310</td>
<td>265</td>
</tr>
<tr>
<td>Rank⁹</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>per capita</td>
<td>3.5</td>
<td>3.2</td>
</tr>
<tr>
<td>Rank</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td><strong>Natural Gas</strong>¹⁸</td>
<td>652,900</td>
<td>97,440</td>
</tr>
<tr>
<td>per capita¹⁹</td>
<td>2,186</td>
<td>1,182</td>
</tr>
<tr>
<td>Rank²⁰</td>
<td>16</td>
<td>31</td>
</tr>
<tr>
<td><strong>Beer</strong>¹⁰⁺¹²</td>
<td>85</td>
<td>119</td>
</tr>
<tr>
<td>Rank¹¹</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td><strong>CFC</strong>¹³ (tons)</td>
<td>23,385</td>
<td>0</td>
</tr>
<tr>
<td>Rank¹⁴</td>
<td>32</td>
<td>0</td>
</tr>
<tr>
<td><strong>Soft Drink</strong>¹⁶⁺¹²</td>
<td>216</td>
<td>72</td>
</tr>
<tr>
<td>Rank¹⁷</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td><strong>Bottled Water</strong>¹⁰</td>
<td>46.8</td>
<td>109.2</td>
</tr>
<tr>
<td>Rank¹⁸</td>
<td>7</td>
<td>5</td>
</tr>
</tbody>
</table>

| per capita²³    | 27,972,583     | 20,089,233     |
| Rank²⁴          | 4             | 11            |

1) Total (1000 barrels daily)
2) Among 218 countries
3) Barrel/day/1000 people
4) Among 213 countries
5) Source: CIA World Fact books, 2008
6) Billion KWh
7) In KWh
8) Billion short tons consumed per year
9) Among 41 countries
10) Liters per person per year
11) Among 18 countries
12) Source: Global Market Information Database, published by Euromonitor
14) Among 102 countries
15) Banned since 1991
16) Carbonated soft drinks, Liters per person per year, 2002
17) Among 18 industrialized countries
18) Total consumption in million cu m, 2007
19) Total consumption in cu m, 2007
20) Among 109 countries
21) Market value of all goods and services, in million dollars
22) Source: World Development Indicators Database
23) In dollars
24) Among 182 countries
In addition, numerous interrelationships exist within the mentioned realms of thinking that require a more holistic and transdisciplinary approach such as the ecological economics viewpoint, with which this literature review concludes (See figure 2, p.20).

![Diagram of interrelationships in waste management and recycling]

Figure 2. Several research approaches to waste management and recycling.

**Consumerism**

Although an international phenomenon, consumerism is one of the major characteristics of the Western industrialized world. With its roots in the era of Industrial Revolution and the end of scarcity, almost immediately, products became available in great quantities, low prices, and available almost to everyone; the era of mass consumption began. Criticism of consumerism began by the end of the last century. Veblen (1902) saw this phenomenon and his theories of “Conspicuous Consumption”,

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which placed consumption as a matter of status display, has been influential since then.

After the 1960s and due to emerging environmental problems such as pollution and resource conservation following the energy crisis of the 1970s, consumerism became more promulgated within industrialized societies. Various individuals and groups looked for alternative lifestyles, such as “simple living,” “buy local,” or “eco-conscious.” Today, however, in the age of globalization and the accompanying serious global and anthropogenic environmental problems, the topic has become more urgent than ever.

Within the extensive amount of literature on consumerism, the most relevant field to the present study is the field of environmental psychology. Researchers seek behavioral patterns that might lead to a pro-environmental behavior in different stages of human interaction; from purchasing- to recycling behavior.

Recycling is a repeated behavior (Mannetti et al., 2004). In the field of applied behavioral analysis, research is based on the assumption that “people are egoistic utility maximizers and their behavior can be regulated by an adequate manipulation of rewards and punishments” (see Porter, Leeming & Dwyer, 1995, for a review), and the amount of rewards within present free-market economy is overwhelming. It is important for policy makers to understand people’s motivation to recycle and “translate” interventions to policy instruments such as tax incentives. The better decision makers understand these behavioral aspects, the more efficient they implement and enforce laws and regulations, normally.
Understanding human behavioral patterns is one paramount aspect of research on humans’ environmental psychology. Researchers in this field seek to explain the interrelationship between human behavior and their natural environment. Environmental behavior is defined as “all types of behavior that change the availability of materials or energy from the environment or alter the structure or dynamics of ecosystems or the biosphere” (Steg & Vlek, 2008, p. 1, emphasis added). One of the main challenges in this field is to promote behavioral changes in order to manage environmental problems, as Steg and Vlek note. Gardner and Stern (2003) emphasize that a change in purchasing behavior is more beneficial to the environment than recycling or reusing available products. According to Steg and Vlek (2008), some major research areas, for instance, include: 1) motivational factors and three lines of research within it\(^5\), 2) contextual factors\(^6\), and 3) habitual behavior. Another influential framework for instance, is the “Theory of Planned Behavior” (Ajzen, 1991), which has been successful in explaining different types of environmental behavior.

\[\text{Consumer Sovereignty, Economy, and Marketing}\]

“Consumer sovereignty” is the belief that consumer satisfaction is the ultimate economic goal and that the economy is fundamentally ruled by consumer desires; the main argument is that final consumption is the ultimate purpose of all economic activity and consumers generate demand (Goodwin et al., 2007). Naturally, this view has opponents that do not consider individuals as mere “consumers.” Besides satisfying basic needs, people are also interested in other goals such as self-realization, fairness, freedom,

\(^5\) Weighing costs and benefits; moral and normative concerns; affect.
\(^6\) Such as availability of recycling facilities; quality of public transport; market supply of goods.
participation, social relations, and ecological balance and if the economy is to promote well-being, all these goals must be taken into account. (Goodwin et al., 2007).

Furthermore, marketing professionals are interested in a 5-step-process and consider it as a trial-and-error pattern; 1) problem recognition, 2) information search, 3) evaluation of alternatives, 4) purchase decision, 5) post-purchase behavior (Goodwin et al., 2007). In marketing industry’s thought process, within the present free-market economy, the 5-step-loop must be closed in order for the economy to grow.

Sustainable Consumption

The neoclassical free-market economy promotes household consumption - buying goods and services- regardless of its environmental impacts. Research on ecological economics on the other hand, scrutinizes the mentioned approach and is determined to find a middle course consisting of economic prosperity and environmental sustainability. The research community within this realm agrees that the scale of the economy is now so large that nature's basic life support systems for humans are threatened (Røpke, 2005b, p. 266). In applying the biophysical approach on economic processes, there is a need for re-thinking of core economic ideas such as production, consumption, value, costs etc. (Røpke, 2005a).

Do humans really ‘produce’ anything, when according to the first law of thermodynamics we cannot create anything from nothing, or is the word ‘procurement’ a better term for this transformation? We ‘consume’ but obviously, what we consume does not disappear, rather it transforms (Røpke, 2005a). What are the driving forces behind the growing consumption, Røpke (2005a) asks. The ‘false assumptions’, she argues, are: 1) the low energy prices (without considering the externalities related to the use of energy);
2) the entire infrastructure that has been built on these ‘false assumptions’; 3) global transfers that are based on unequal power structures within the market institutions; and 4) competition in market economies (search for innovations, and new marketing strategies); all factors that equate economic growth with progress and emphasize the need for growth to maintain employment (p. 9). Binswanger (2001) refers to these strong forces as ‘rebound effect:’ environmental improvement through increased technological efficiency, counterbalanced by growing consumption.

Laws, Regulations, and Policies

The main target of recycling policies is households as the ultimate decision-making unit (Jenkins et al., 2003). Research on the effectiveness of waste management policies remains a paramount task in the realm of environmental sciences. One main goal of waste management policy is to increase recycling participation. Due to the stricter USEPA requirements for landfill construction and the consequent increasing landfill tipping fees, the emergence of new solutions became inevitable (OTA, 1989). Among several attempts since the 1980s to reduce the quantities of landfilled waste and to optimize waste management policy, three main programs have gained more attention (Jenkins et al., 2003). These programs are: 1) residential curbside recycling programs (CRP) that is considered as a substitute of 2) drop-off recycling, and 3) “Pay-As-You-Throw” (PAYT) programs as volume based programs where households are charged relative to the number of containers they set out (unit pricing). Each program has its own advantages and downsides. Policy should include information about; 1) the material composition of the local waste stream, 2) local collection and transportation costs, and 3)
current market prices for recyclable materials, to determine whether a program is environmentally sound and economically reasonable (Jenkins et al., 2003).

Curbside Recycling Programs. Municipalities have been adopting curbside recycling programs at a staggering rate in the past three decades in Germany, as well as in the U.S. Curbside recycling is less time consuming, more convenient, and it consequently reduces households’ recycling costs (e.g. opportunity costs of leisure). It is also widely recognized and visible (curbside containers on collection day). With regard to environmental burdens (e.g. global warming, acidification, and eutrophication) and the related energy consumption, research has identified undeniable advantages in favor of curbside recycling as opposed to curbside collection for landfilling or incineration. For instance, in a collaborative, comparative study, using life cycle assessment methods, Morris (2004) concludes that using recycled rather than virgin materials for manufacturing new products conserves energy and prevents pollution by a substantial margin (p. 273). Even generating energy from waste (Waste to Energy programs) is a highly debated topic in the world. For instance, although according to an USEPA estimate, only 5.4% of plastics are being recycled (Waste Cap Nebraska, 2009), through the combustion of plastics such as polyvinyl chloride (PVC) toxic gases are released in the environment. The trapped pollutants that reside in filters and ash need to be appropriately landfilled (Waste to Energy, 2008). In the absence of strict regulations, this method bears a significant risk to the natural environment. Nebraska is among the twenty states that has no such programs (Arsova et al., 2008). Reschovsky and Stone (1994) suggest a combination of convenient mandatory recycling and curbside pickup to be the
best practice. In addition, they reject the flat-fee policy and argue that marginal cost pricing is much more effective.

*Drop-off Recycling.* Drop-off programs are notorious for being poorly publicized (Jenkins et al. 2003) and the knowledge of the locations of drop-off centers varies among households. The fact that the location of drop-off centers are relevant only for households without curbside pickup (Reschofsky and Stone, 1994), must be considered in decision making processes. In addition, the proximity of a drop-off location is an important convenience and cost factor for households that should be considered.

*Volume-Based Unit Pricing.* In making households sensitive to the weight of the waste, this policy variable is a direct incentive to decrease waste amounts and to reduce at least bulky waste items as well. This could lead to a direct change in purchasing behavior and serves as an important feedback for producers of household items to adjust their packaging standards to easy-to-recycle wastes (e.g. plastic milk jugs). Nonetheless, Jenkins et al.’s (2003) finding is consistent with the findings of earlier research: “unit pricing does not significantly affect the level of recycling or the probability of participation in recycling programs” (p. 312). These findings differ from other results. In a different cultural setting, Hong’s (1999) assessment reveals that a rise in waste collection fee in a unit pricing framework “induces households to recycle more wastes.” Consistent with Hong’s (1999) findings, research does suggest that households are more sensitive to the marginal private costs of waste reduction and less sensitive to the costs of waste disposal (Reschofsky and Stone, 1994).

*Regulations and ethics.* “Are we obligated to act so as to maximize value? If so, whose value?”, asks John Cobb in his article (Daly and Townsend, 1993, p. 217). He
refers to the “familiar utilitarian principle” that “an ethical action is one that seeks the greatest good for the greatest number of men” (p. 218). Regulatory policies usually mitigate the relationship between industry, government, and other individual and collective stakeholders (Harrington, 1996). The proper ethical analysis of policy choices helps all the actors to evaluate the ultimate success of those policies. According to Harrington (1996), acknowledging the competing and conflicting interests of all relevant stakeholders and maximizing the balance of those interests should be policy’s first goal.

The three main benefits of an ethical regulatory policy according to Harrington (1996) are; 1) public conversation in order to “separate noise from data,” 2) encouraging explicit choices with regard to policy alternatives, and 3) engaging “moral scrutiny” in policy making.

Another interesting question is, at what point should policy first apply to the market? Should it regulate the quantity or the price? Economists and policy makers have been discussing these ‘simple’ questions for centuries. As resources become scarcer, populations grow, and the degree of natural capital depletion increases, the need for a sustainable regulatory policy becomes more urgent. Markets reveal preferences for market goods, yet numerous goods and services that enhance human welfare are non-market goods. Put differently, market, by definition, is not capable of telling consumers how much clean air, healthy wetland, or healthy forest we should have (Daly and Farley, 2003). How ethical is a policy that does not realize this notion? Daly and Farley (2003) refer to two ‘philosophical presuppositions’ (p. 360) that policy requires: first, policy should be nondeterministic (i.e. there are always real alternatives); second, it should be nonnihilistic (i.e. accepting that some states of the world are better than others). These are
the very fundamental ethical attributes of a regulatory policy. An ethical regulatory policy in the field of natural resources should have the following basic goals: sustainable scale, just distribution, and efficient allocation (Daly and Farley, 2003, p. 360).

*Regulation, Pollution, and Costs.* Kahn (2002) takes a fiscal approach to environmental regulation. In his extensive review of the environmental regulation trends in the United States, Kahn introduces 13 empirical studies of residential waste supply and recycling and argues that environmental regulation in the United States has increased pollution reduction expenditure and compares these expenses as a percentage of GNP in 1972 (1.7%) and 2000 (2.6%). Kahn (2002) concludes that the tendency to support the environment differs across demographic groups. However, it must be noted that the increase in these expenses may be compensated by a decrease in other environmental costs that occur, for instance, due to decreased landfilling operations and fewer environmental consequences.

*Regulation, Motivation, and Consumption.* Van den Bergh (2008), in his empirical meta-analysis of environmental regulation, combines the socio-economic and psychological determinants and by referring to an OECD study (OECD 2002), postulates stringent policies in order to prevent the increasing household consumption within the OECD countries. He emphasizes the need to understand consumers’ motivation in choosing certain types of products and product-use behavior and control factors that are sensitive to consumption and to do this, policy needs particular information to achieve sustainable consumption rates. He notes that there is “no serious economic policy aimed at waste [that] has been implemented at a large scale” in the U.S. (p. 563). He criticizes flat-fee pricing and argues, that the “price” in this model is unrelated to the amount of
generated waste; another important measure that a regulative policy should consider. For Van den Berg (2007), price regulation is hardly effective, and perfect monitoring combined with a downstream tax would be the most attractive solution.

**Applied Price Policy.** Price policy is another tool that traditional economists apply in order to reach their definition of ‘efficiency.’ Van den Bergh (2008) refers to upstream and downstream taxes; the former concept aims to internalize the waste treatment costs in the price of the product, a deposit-refund system, or a ‘waste tax.’ The latter idea determines the amount of the tax in a direct fiscal manner; based on; 1) the unit-based pricing system, in which the fee depends on the actual amount of waste generated, and 2) proximity indicators such as the number of persons in a household. The downside of this policy is the high enforcement and monitoring costs, high social costs (e.g. illegal dumping), and the resulting new externalities.

Another fundamental debate within research is the point of policy application. Conventional environmental economics research studies only the ‘last stage’ of the waste management (i.e., the stage that begins when waste is placed in containers), and considers households as the dominant responsible factor for determining how to treat municipal waste (Lavee, 2007). “In the United States, the costs associated with the municipal-collection segment account for more than two thirds of the overall costs of waste disposal” (Ackermann, 1997, p.79, emphasis added). This stream of thinking ignores the process in which waste is produced, that is the earlier stage of the product life cycle (Lavee, 2007, p. 927). The ecological economics view on the other hand, scrutinizes the ‘early stage’ research and places responsibility for waste recycling on producer (e.g.

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7 A deposit-refund system or a ‘waste tax’ on consumption good to internalize the waste treatment costs in the price of the product.
Eichner and Pethig, 2001). The German “Green Dot” concept is a good example of producer responsibility.

While they are beyond the scope of this study, other approaches to waste management exist (See Figure 2). The following sections briefly discuss these approaches.

*Environmental Psychology*

Recycling, in connection with the human behavioral patterns, has captured the attention of the field of environmental psychology as well. As mentioned before, attributes such as behaviors, intentions, social norms, and values are subjects of discussion in this field.

Rokeach (1973) defines values as relatively few in numbers, generalized, internal, and relatively stable standards that transcend specific situations. Most importantly, he argues, they are guides for behavior and should have a measurable influence on behavioral choice. Karp (1996) investigates this question in his study and asks, “Do values influence pro-environmental behavior?” Strongly leaning on Schwartz’s (1992) influential work (Schwartz Value Scale”), his quantitative analyses confirms that values do influence behavior. According to Pløger (2004), identifying ethical value issues and engaging critically and effectively in the realm of planning, through planning legislation and other instruments, is the most desirable requirement that planners should meet. Furthermore, Pløger (2004) argues that ethics discourse is rare among planners; however, morality and ethics are part of people’s lives and work and he insists on consideration of ethics in planning (p. 50).

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8 Schwartz has developed a broad model for classifying the dimensions of values with 56 value items representing 10 universal value types (Schulz et al., 2005).
Referring to a previous study by Stern and Dietz (1994), Schulz et al. (2005) introduce a three-factor structure of environmental attitudes which is based on peoples’ valued objects that are “oriented around three basic sources: self, other people, [and] all living things” (p. 458). Schulz and Zelezny (1998) confirm this division; their results indicate for instance, “pro-environmental behavior is positively associated with biospheric values” (p.554). Notable for the present study is the “generalizability of the structure of environmental attitudes across cultures (emphasis added),” as Schulz et al. (2005) assess in their study (p. 470).

Sustainability

At least since 1987, after presenting the first official definition of the term “sustainability” by the “Brundtland Commission” (WCED, 1987), the focus changed and there has been an extensive amount of literature on sustainability issues. Each field of study has developed and defined its own interpretation of the term. Conventional free-market economics, for instance, defines three forms of sustainability; 1) socio-economic (demand-revenue), 2) engineering (infrastructure), and 3) environmental (resources), (Sahely et al., 2005). As opposed to this mechanical division, the ecological economic viewpoint contemplates the world as finite and places an economic subsystem within the earth ecosystem, and not vice versa, as suggested from neoclassical economics (Daly and Farley, 2003).

Research on sustainability assessment is another vast area that has emerged in the past decade. For instance, Pope et al. (2005) review and discuss the practicability of previous assessment models to determine their efficiency and apply their own model in a case study in Australia. Graymore et al. (2008) scrutinize the usefulness of such
assessments and models at a regional scale and evaluate indicators such as ecological footprint, wellbeing assessment, ecosystem health assessment, quality of life, and natural resource availability. As to the importance of the issue, researchers began to define indices for a sustainable society in order to benchmark the sustainability degree among different countries. Generally, from an anthropocentric viewpoint and having “Brundtland” in mind, the term comprises three elements: depletion of resources, ecological and environmental aspects, and quality of life (Van de Kerk, 2009). Among the 22 sustainability indicators developed in Van de Kerk’s research, waste recycling, land quality, ecological footprint, and good governance are interesting measures relevant to the present study. The interconnectedness of all the mentioned indicators and domains is apparent.

Tools, Applications and Indices

Policy relies on economic data in order to implement laws passed by legislature; lawmakers, on the other hand, need fundamental scientific research results, performed mainly by unbiased scientists, in order to understand the interrelationships among several fields. The anthropogenic nature of present environmental problems and its relationship with economic growth has been an object of debate in environmental economics for over two decades. Traditional free market economics’ main arguments hinge on issues such as economic efficiency, cost-benefit analysis (as a tool), competition, material substitution, and the regulating abilities of the free market. Externality issues, such as pollution or waste generation, “require(s) no government intervention - market forces are perfectly capable of sorting [them] out” (Daly, 2003, p. 177).
Kuznets (1955) attempted to establish a relationship between various indicators of environmental degradation and income per capita. His theory asserts that in the early stages of economic growth degradation and pollution increase; however, after reaching some level of income per capita the trend reverses, so that at high-income levels economic growth leads to environmental improvement. This implies that the environmental impact indicator is an inverted U-shaped function of income per capita (Kuznets curve). The curve is named for Kuznets (1955) who hypothesized income inequality first rises and then falls as economic development proceeds (Stern 2003), and it is another instrument used by economists to explain the relationship between economy and the environment.

With regard to consumption, the ecological economics’ tax-approach is another notable tool. Howarth (2005) analyzes the links between climate change and the world economy in the presence of pre-existing taxes on labor and capital. He builds his analysis around a one-sector growth model in which trends in human population and technological change are represented as independent of public policies and economic decisions. In his "base model", Howarth (2005) argues that people’s preferences are independent of social context; in following sections, he revises this model and emphasizes the importance of relative consumption effects in order to motivate the consumer’s economic behavior. He then concludes that there is a strong positive correlation between relative consumption effects and "eco"-taxes. In addition, he notes that if the emission tax revenues are returned to private households, it has a huge encouraging effect for citizens to live in a more sustainable manner.
**Gross Domestic Product (GDP) or Genuine Progress Indicator (GPI).** The question of the “best” economic index has been another debate topic in the past decades and it continues. To explain the detailed economic aspects of different socio-economic indicators is not the present study’s main concern. However, the topic gains importance as using indices to justify policy is one of the important arguments for policy makers. A brief description of the common Gross Domestic Product (GDP) index and the less popular GPI index may be helpful to understand the differences and to justify their specific purpose.

Gross National Product (GNP), now measured on a daily basis as Gross Domestic Product-GDP, is the most popular index, not only for traditional economists, but also for the public. Introduced during World War II as a measure of wartime production capacity, it is an important index for it is used by economists, policymakers, international agencies, and the media as the primary scorecard of a nation’s economic health and well-being. Yet, as we know from its creator Simon Kuznets, the GDP was never intended for this role (Talberth et al., 2006; Kuznets, 1934). GDP has numerous deficiencies (Talberth et al., 2006). First, it simply assumes that every monetary transaction adds to well-being. As far as the environmental aspect is concerned, the contributions of the natural habitat in providing resources are seen as economic gain. To GDP advocates, every monetary transaction contributes to human well-being. Second, it ignores the non-market economy of households and community (childcare, eldercare, volunteer work) and if the non-market economy declines and its functions shift to the monetized private sector, the GDP interprets this process as economic gain. Third, as GDP increases, the more a nation depletes its natural resources. Even within the realm of traditional economics, this is a
violation of basic accounting principles: treating the depletion of natural capital as income, rather than as the depreciation of an asset. Fourth, the GDP ignores the distribution of the income: From 1973 to 1993, while GDP rose by over 50 percent, wages suffered a decline of almost 14 percent (Talberth et al., 2006). For policy, in addition to the GDP as a monetary index, there is a need for a more accurate and objective barometer concerning the real human well-being.

Genuine Progress Indicator (GPI), on the other hand, adds the economic contributions of family, community, and the natural habitat to the conventionally measured economic production (Talberth et al., 2006). It considers more than twenty economic factors that GDP simply ignores (e.g. pollution, income distribution, resource depletion, long-term environmental damage). It also differentiates between economic transactions that add to well-being and those which diminish it. The GPI then integrates these factors into a composite measure and is a much more objective measure for stakeholders.

In a unique and extensive study, Costanza et al. (2004) apply the GPI to evaluate the situation in Vermont. They emphasize the non-marketed work of nature in providing clean air, water, etc. They conclude that GPI is a more comprehensive approach in assessing economic progress than GDP. It is feasible to apply the GPI approach at these scales and to compare across scales and with the national average. Elaborating on the concept of GPI is beyond the scope of the present study.
CHAPTER 3

Methodology

Within a qualitative, comparative, and exploratory research, this study examines the effect of regulation on adoption of household solid waste management in the United States and Germany by considering consumerism and observing specific laws and regulations. Two cities, Lincoln in Nebraska, U.S.A., and Augsburg in Germany were compared. Official (local, national and international) economic measures were chosen as representative consumption indicators in order to obtain the general picture on private consumption (expenditure) in both cities (countries). Where data are not available, the general trend is inferred from national data and due to similar demographic attributes, rural characteristics, and their federal and democratic government structures, the two cities are considered as “typical” in their respective countries. Several governmental statistics, reports, and evaluations within the public domain were collected and analyzed.

As consumerism is one of the main pillars in a free-market economy consumption data are utilized. The present study considers over-consumption as one of the main “barriers” to environmental sustainability. The pace of consumption in its global temporal and spatial dimensions is faster than enacting or adoption of laws and regulations; one result of this discrepancy is the fact that most recycling efforts are reduced to mere management of the generated waste, and not the avoidance of it. This behavior is inherent to Adam Smith’s Laissez-faire economy.

Regulations, laws, and policies, as this study’s second important pillar, ultimately reflect the wants and needs of a society. The legislative body sets goals and priorities in accordance with beliefs of the leading majority. In enacting and passing a law, or
introducing a regulation, the legislative entity aims at improvement and progress; it relies on unbiased data, information, and research results and hopes to achieve the desired results. However, depending on the social, political, and economic structure of the society, the results may vary; corrections and amendments might become necessary. The dynamic character of laws and regulations is a significant feature of pluralistic democracies. However, the present study compares household solid waste laws and regulations in Germany and in the United States to demonstrate the, partly, fundamental differences in legislation. The present study will attempt to answer the question, whether the two different concepts affect the amount of recycled material and improve the well-being of the respective constituencies.

The Main Resources

The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety in Germany vs. the Environmental Protection Agency in the United States, are the two main resources for national laws, regulations, and statistics. At state level, the Bavarian State Ministry for Environment and Health and its additional state authority, the Bavarian State Bureau for Environment, as well as Nebraska’s Department of Environmental Quality are major sources of information. However, within the vast amount of data, it is essential to incorporate the following considerations and limitations: (a) the study’s resource inquiry distinguishes between household solid waste and the commercial waste, as the waste composition, and the respective management plans in the two sectors are in part, fundamentally different; and (b) different types of household solid waste must be considered differently. As far as waste management is concerned, the handling of used batteries, for instance, is different than that of paper or glass. Finally, (c)

9 Headquarters in Augsburg.
the study considers household-specific waste management programs as opposed to programs and policies that aim at the interactions between consumers and the retail sector (e.g. refund systems at grocery stores).

*Data Collection*

In a descriptive framework, through internet search, public resources and several documents and artifacts from both communities are collected. These include laws and regulations, communities’ demographic data, national and international consumption statistics and sustainability reports, department mission statements, departmental mandates, and special programs such as recycling promotion days; all this information is accessible to research community. Another important source of information is data and statistics published in peer-reviewed journals in this field.

Following the evaluation of the acquired data, in a top-down-approach, their reliability and validity, as well as the consistency in the thought process within the two legislations were examined and finally the information was compiled in order to converge at the study’s central questions. Several tables and statistics were analyzed and for the goals of the present study combined and redesigned. The premise that regulation and citizens’ participation through consumption affect the amount of recycled waste, is correct or not, was verifiable in both settings.

Furthermore, for instance, in order to maintain the same metric, the annual fluctuation of indices such as the GDP and its largest component “private consumption,” as “measured” consumption, and their relationship with the amount of recycled household solid waste in a predefined period (e.g. 20 years) are established to

\[ \text{GDP} = \text{private consumption} + \text{gross investment} + \text{government spending} + (\text{exports} - \text{imports}) \]
support the study’s objectives. In general, construction and demolition debris, bio-waste, and industrial process wastes are not the scope of the present study.

CHAPTER 4
Research Findings

The United States

The USEPA has prioritized the integrated waste management hierarchy in the United States in order of preference: source reduction, recycling, combustion with energy recovery, and disposal through landfilling (USEPA, 2007b). Annual MSW generation has been increasing in the United States since 1960, when it was 88 million tons (USEPA, 2007b). More than 254 million tons of MSW was generated and 33.4 percent was recycled in 2007 (see Figure 3 and Figure 4).

![Graph of MSW generation rates in the US, 1960 to 2007 (USEPA, 2007a).](image)

Figure 3. MSW generation rates in the US, 1960 to 2007 (USEPA, 2007a).
Figure 4. MSW recycling rate in the US, 1960 to 2007 (USEPA, 2007a).

The USEPA uses two methods to characterize the generation of MSW, by material (paper, yard trimmings, food scraps, and plastics), and by major product categories which include durable goods (such as furniture), nondurable goods (paper and clothing), containers and packaging (milk cartons and plastic wrap) (see Figure 5 and Figure 6).

Figure 5. Generation of waste types in MSW in the US, 2007 (USEPA, 2007a).
Figure 6: Products generated in MSW in the US, 2007 (254 million tons before recycling) (USEPA, 2007a).

The amount of paper and paperboard recycled in 2007 was the highest among other materials (54.5%) and the recovery of containers and packaging was the highest of the three product categories (see Table 3 and Table 4).
Table 3. Generation and recovery of materials in MSW in the US, 2007 (in mil. tons).

(USEPA, 2007a).

<table>
<thead>
<tr>
<th>Material</th>
<th>Weight Generated</th>
<th>Weight Recovered</th>
<th>Recovery As a Percent of Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper and paperboard</td>
<td>83.0</td>
<td>45.2</td>
<td>54.5%</td>
</tr>
<tr>
<td>Glass</td>
<td>13.6</td>
<td>3.22</td>
<td>23.7%</td>
</tr>
<tr>
<td>Metals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel</td>
<td>15.6</td>
<td>5.28</td>
<td>33.8%</td>
</tr>
<tr>
<td>Aluminum</td>
<td>3.35</td>
<td>0.73</td>
<td>21.8%</td>
</tr>
<tr>
<td>Other nonferrous metals*</td>
<td>1.76</td>
<td>1.22</td>
<td>69.3%</td>
</tr>
<tr>
<td>Total metals</td>
<td>20.8</td>
<td>7.23</td>
<td>34.8%</td>
</tr>
<tr>
<td>Plastics</td>
<td>30.7</td>
<td>2.09</td>
<td>6.8%</td>
</tr>
<tr>
<td>Rubber and leather</td>
<td>7.48</td>
<td>1.10</td>
<td>14.7%</td>
</tr>
<tr>
<td>Textiles</td>
<td>11.9</td>
<td>1.90</td>
<td>15.9%</td>
</tr>
<tr>
<td>Wood</td>
<td>14.2</td>
<td>1.32</td>
<td>9.3%</td>
</tr>
<tr>
<td>Other materials</td>
<td>4.43</td>
<td>1.16</td>
<td>26.2%</td>
</tr>
<tr>
<td>Total Materials in Products</td>
<td>186.1</td>
<td>63.3</td>
<td>34.0%</td>
</tr>
<tr>
<td>Other wastes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food, other**</td>
<td>31.7</td>
<td>0.81</td>
<td>2.6%</td>
</tr>
<tr>
<td>Yard trimmings</td>
<td>32.6</td>
<td>20.9</td>
<td>64.1%</td>
</tr>
<tr>
<td>Miscellaneous inorganic wastes</td>
<td>3.75</td>
<td>Neg.</td>
<td>Neg.</td>
</tr>
<tr>
<td>Total Other Wastes</td>
<td>68.0</td>
<td>21.7</td>
<td>31.9%</td>
</tr>
<tr>
<td>TOTAL MUNICIPAL SOLID WASTE</td>
<td>254.1</td>
<td>85.0</td>
<td>33.4%</td>
</tr>
</tbody>
</table>

Includes waste from residential, commercial, and institutional sources.

* Includes lead from lead-acid batteries.

** Includes recovery of other MSW organics for composting.

Details may not add to totals due to rounding.

Neg. = Less than 5,000 tons or 0.05 percent.
Table 4. Generation and recovery of products in MSW, in the US, 2007 (in mil. tons). (USEPA, 2007a)

<table>
<thead>
<tr>
<th>Products</th>
<th>Weight Generated</th>
<th>Weight Recovered</th>
<th>Recovery as a Percent of Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Durable Goods</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel</td>
<td>13.0</td>
<td>3.55</td>
<td>27.3%</td>
</tr>
<tr>
<td>Aluminum</td>
<td>1.26</td>
<td>Neg.</td>
<td>Neg.</td>
</tr>
<tr>
<td>Other non-ferrous metals*</td>
<td>1.76</td>
<td>1.22</td>
<td>69.3%</td>
</tr>
<tr>
<td><strong>Total metals</strong></td>
<td>16.0</td>
<td>4.77</td>
<td>29.8%</td>
</tr>
<tr>
<td>Glass</td>
<td>2.11</td>
<td>Neg.</td>
<td>Neg.</td>
</tr>
<tr>
<td>Plastics</td>
<td>10.4</td>
<td>0.50</td>
<td>4.8%</td>
</tr>
<tr>
<td>Rubber and leather</td>
<td>6.48</td>
<td>1.10</td>
<td>17.0%</td>
</tr>
<tr>
<td>Wood</td>
<td>5.63</td>
<td>Neg.</td>
<td>Neg.</td>
</tr>
<tr>
<td>Textiles</td>
<td>3.33</td>
<td>0.46</td>
<td>13.8%</td>
</tr>
<tr>
<td>Other materials</td>
<td>1.41</td>
<td>1.16</td>
<td>82.3%</td>
</tr>
<tr>
<td><strong>Total durable goods</strong></td>
<td>45.4</td>
<td>7.99</td>
<td>17.6%</td>
</tr>
<tr>
<td><strong>Nondurable Goods</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper and paperboard</td>
<td>43.1</td>
<td>20.3</td>
<td>47.1%</td>
</tr>
<tr>
<td>Plastics</td>
<td>6.68</td>
<td>Neg.</td>
<td>Neg.</td>
</tr>
<tr>
<td>Rubber and leather</td>
<td>0.97</td>
<td>Neg.</td>
<td>Neg.</td>
</tr>
<tr>
<td>Textiles</td>
<td>8.34</td>
<td>1.44</td>
<td>17.3%</td>
</tr>
<tr>
<td>Other materials</td>
<td>3.15</td>
<td>Neg.</td>
<td>Neg.</td>
</tr>
<tr>
<td><strong>Total nondurable goods</strong></td>
<td>62.2</td>
<td>21.8</td>
<td>35.0%</td>
</tr>
<tr>
<td><strong>Containers and Packaging</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel</td>
<td>2.68</td>
<td>1.73</td>
<td>64.6%</td>
</tr>
<tr>
<td>Aluminum</td>
<td>1.87</td>
<td>0.73</td>
<td>39.0%</td>
</tr>
<tr>
<td><strong>Total metals</strong></td>
<td>4.55</td>
<td>2.46</td>
<td>54.1%</td>
</tr>
<tr>
<td>Glass</td>
<td>11.5</td>
<td>3.22</td>
<td>28.1%</td>
</tr>
<tr>
<td>Paper and paperboard</td>
<td>39.9</td>
<td>24.9</td>
<td>62.4%</td>
</tr>
<tr>
<td>Plastics</td>
<td>13.6</td>
<td>1.59</td>
<td>11.7%</td>
</tr>
<tr>
<td>Wood</td>
<td>8.54</td>
<td>1.32</td>
<td>15.5%</td>
</tr>
<tr>
<td>Other materials</td>
<td>0.31</td>
<td>Neg.</td>
<td>Neg.</td>
</tr>
<tr>
<td><strong>Total containers and packaging</strong></td>
<td>78.4</td>
<td>33.5</td>
<td>42.7%</td>
</tr>
<tr>
<td><strong>Other Wastes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food, other**</td>
<td>31.7</td>
<td>0.81</td>
<td>2.6%</td>
</tr>
<tr>
<td>Yard trimmings</td>
<td>32.6</td>
<td>20.9</td>
<td>64.1%</td>
</tr>
<tr>
<td>Miscellaneous inorganic wastes</td>
<td>3.75</td>
<td>Neg.</td>
<td>Neg.</td>
</tr>
<tr>
<td><strong>Total other wastes</strong></td>
<td>68.0</td>
<td>21.7</td>
<td>31.9%</td>
</tr>
<tr>
<td><strong>TOTAL MUNICIPAL SOLID WASTE</strong></td>
<td>254.1</td>
<td>85.0</td>
<td>33.4%</td>
</tr>
</tbody>
</table>

Includes waste from residential, commercial, and institutional sources.

* Includes lead from lead-acid batteries.

** Includes recovery of other MSW organics for composting.

Details may not add to totals due to rounding.

Neg. = Less than 5,000 tons or 0.05 percent.
The USEPA (2007) estimates the portion of residential waste (including waste from multi-family dwellings) to be 55 to 65 percent of the total MSW generation (Figure 1). Every American generated 4.62 pounds of waste per day in 2007; a slight decrease compared with 2006 (4.65) (see Table 5).

Table 5. Generation, materials recovery, composting combustion with energy recovery, and discards of municipal solid waste, 1960-2007 in the US (in pounds per person per day) (USEPA, 2007a).

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Generation</td>
<td>2.08</td>
<td>3.25</td>
<td>3.66</td>
<td>4.50</td>
<td>4.65</td>
<td>4.66</td>
<td>4.63</td>
<td>4.65</td>
<td>4.62</td>
</tr>
<tr>
<td>Recovery for recycling</td>
<td>0.17</td>
<td>0.22</td>
<td>0.35</td>
<td>0.64</td>
<td>1.03</td>
<td>1.07</td>
<td>1.09</td>
<td>1.12</td>
<td>1.15</td>
</tr>
<tr>
<td>Recovery for composting*</td>
<td>Neg.</td>
<td>Neg.</td>
<td>Neg.</td>
<td>0.09</td>
<td>0.32</td>
<td>0.38</td>
<td>0.38</td>
<td>0.38</td>
<td>0.39</td>
</tr>
<tr>
<td>Total materials recovery</td>
<td>0.17</td>
<td>0.22</td>
<td>0.35</td>
<td>0.73</td>
<td>1.35</td>
<td>1.45</td>
<td>1.47</td>
<td>1.50</td>
<td>1.54</td>
</tr>
<tr>
<td>Combustion with energy recovery†</td>
<td>0.00</td>
<td>0.01</td>
<td>0.07</td>
<td>0.65</td>
<td>0.66</td>
<td>0.59</td>
<td>0.58</td>
<td>0.58</td>
<td>0.58</td>
</tr>
<tr>
<td>Discards to landfill, other disposal‡</td>
<td>2.51</td>
<td>3.02</td>
<td>3.24</td>
<td>3.12</td>
<td>2.64</td>
<td>2.62</td>
<td>2.58</td>
<td>2.57</td>
<td>2.50</td>
</tr>
<tr>
<td>Population (millions)</td>
<td>179.979</td>
<td>203.984</td>
<td>227.255</td>
<td>249.907</td>
<td>281.422</td>
<td>293.660</td>
<td>296.410</td>
<td>299.398</td>
<td>301.621</td>
</tr>
</tbody>
</table>

* Composting of yard trimmings, food scraps and other MSW organic material. Does not include backyard composting.
† Includes combustion of MSW in mass burn or refuse-derived fuel form, and combustion with energy recovery of source separated materials in MSW (e.g., wood pallets and tire-derived fuel). See Table 29 footnote for more detail.
‡ Discards after recovery minus combustion with energy recovery. Discards include combustion without energy recovery. Details may not add to totals due to rounding.

The amount of MSW recycled in the United States in 2007 increased to 63.3 million tons, an increase of 1.9 million tons from 2006; this does not include composting. In addition, the recycling rate in 2007 was 1.54 pounds per person per day, an increase of 2.7 percent over 2006. Discards sent to landfills after recycling and combustion with energy recovery declined to 2.50 pounds per person per day in 2007. This is a decrease of 2.7 percent from 2006 to 2007 (USEPA, 2007a); generally, a positive trend. During 2007,
about 137 million tons of MSW was landfilled (54%) (Figure 7).

![Pie chart showing waste management in the US in 2007.](chart)

Figure 7. Management of the MSW in the US in 2007 (USEPA, 2007a).

Plastic products generation in 2007 was 30.7 million tons (Table 3), or 12.1 percent of waste generation (Figure 5); this indicates a 3 percent increase compared with 2006 (USEPA, 2007b). In general, plastics generation has grown from 8.3 percent of generation in 1990 to 12.1 percent in 2007 (USEPA, 2007b). Measured by tonnage, the most recovered products and materials in 2007 were corrugated boxes (23.0 million tons), newspapers (8.5 million tons), glass containers (3.2 million tons). There were about 8,660 curbside recycling programs in the United States in 2006 (USEPA, 2007b). The number of landfills decreased in the past 18 years from 7,924 in 1988 down to 1,754 in 2007 (see Figure 8); however, within this period, between 2004 and 2006, an increase in the number of landfills (1,831) is observable (Arsova et al., 2008).
Figure 8. Number of Landfills in the United States, 1988-2007 (USEPA, 2007a)

*Nebraska and Lincoln (Regulations)*

USEPA’s region 7 solid waste program serves Kansas, Iowa, Missouri, and Nebraska. Subtitle D of the RCRA recognizes that state and local governments are primarily responsible for planning and regulating nonhazardous waste (USEPA, 2009a). At the state level, the Nebraska Department of Environmental Quality (NDEQ) is one of the responsible entities for environmental issues; however, it does not regulate recycling programs. The department was created in accordance with the Nebraska Environmental Protection Act of 1971 (NEEPA) and its main mission is the protection of Nebraska’s air, land, and water resources. Nebraska laws and regulations may also refer to federal environmental laws and regulations (NDEQ, 2009a). The Solid Waste Disposal Act of 1976, Title II, Subtitle D – requires all states to implement ‘Solid Waste Plans.’ Nebraska
has named its plan the “Integrated Waste Management Program,” and “Integrated Solid Waste Management Regulations” under Title 132. The Waste Management Division of NDEQ is responsible for the performance of Nebraska’s “Integrated Waste Management Program.” The program however, does not regulate household solid waste management\textsuperscript{11} (NDEQ, 2009f). Furthermore, the Environmental Quality Council of Nebraska was established through the NEEPA to adopt rules and regulations for setting standards for air, water, and land quality (NDEQ, 2009c). In general, one dominant factor in NDEQ’s solid waste management activities in compliance with RCRA is enforcing regulations on treatment facilities for hazardous waste (e.g. NDEQ 2009d). In 2008, 32 grants totaling $810,562 were awarded under the category of “recycling” (NDEQ, 2009d, p. 39); a four percent reduction compared with FY2007 ($841,510) (NDEQ, 2009e, p. 40).

Both household solid waste (HSW) and household hazardous waste (HHW) are not regulated under the state or federal law in Nebraska. Individual states in the United States have considerable autonomy regarding the implementation of waste management laws and regulations. For instance, the “Pay-As-You-Throw” (PAYT) incentive of the USEPA has not found resonance within the 169 communities in Nebraska; only 18 communities (3.4\%) have participated in this incentive; whereas the number of participating communities in the state of Washington was 522 (100\%) (USEPA, 2006).

Waste management in Lincoln is regulated in Lincoln Municipal Code Book, title 8, chapter 8.32. All issues regarding sanitary landfills (location, type of solid waste accepted, permitting, fees, licensing etc.) are regulated here (section 8.32.020 describes the policy). The city council designates the appropriate place for the operation of a public

\textsuperscript{11} It regulates MSW disposal areas (landfills), construction and demolition waste disposal areas, fossil fuel combustion ash disposal areas, and industrial waste disposal areas.
sanitary landfill (8.32.030). The Health Director is responsible for the enforcement of the provisions of this chapter (8.32.250). Three main areas are regulated in the Code Book, sanitary landfills, hazardous waste, and the relationship with the private sector. No curbside collection is regulated in the Code Book and curbside collection is a matter of mutual agreement (contract) between private households and commercial haulers (recyclers). Several private recyclers operate in Lincoln and they accept, or refuse to accept, among 28 different materials, from paper to e-waste (NDEQ, 2009b). Lincoln has eight “recycling programs”¹² (InterLinc, 2009e), 22 multi-material, and five “Newspaper-only” drop-off sites (InterLinc, 2009e).

**Germany**

The annual waste generation has been decreasing in Germany since 1996, when it was 385 million tons (MENCNS, 2007a) (Figure 9). Three hundred eighty-one million tons of MSW was generated in 2005, (United States: 245.7 million tons). From 1996 to 2005, the total household solid waste generation has declined to nearly 14 million tons (1996: nearly 20 million tons), excluding hazardous waste (Figure 10). The annual per capita waste generation has also been decreasing since 1996. (Figure 11).

---

Figure 9. Total waste generation in Germany, 1996-2005 in 1000 tons.

Figure 10. Total household solid waste generation in Germany, 1996-2005 in 1000 tons
Figure 1. Annual household solid waste generation lbs/person in Germany (FOS, 2007).
Measured by tonnage, the most recovered products and materials in 2004 were 8 million tons of bio-waste (2 million tons in 1990), 7.7 million tons of paper (1.6 million tons in 1996), 3.1 million tons of glass (1.3 million tons in 1996), and 4.7 million tons of packaging (zero in 1996) (MENCNS, 2007a). In 1990, households separated 5 million tons (13%) of bio-waste, paper, and glass. This number increased to 23.4 million tons (56%) in 2004. In 1990, 6 million tons of household solid waste was utilized for energy production. This number increased in 2004 to 11 million tons and contributed to a considerable decrease in GHG emissions (MENCNS, 2007a, p. 7). The CO₂ balance sheet in Germany declined from +25.5 million tons (CO₂ equivalent) in 1990 to -0.4 million tons in 2004 and is estimated to be at -7.8 million tons in 2020 (MENCNS, 2007a, p. 2).

Nearly 78.5% (12.15 million tons) packaging waste was recycled in 2007; paper and cardboard (91.1%) and glass (82.6%) were among the highest recycled materials (MENCNS, 2007b, p. 2). A total of 38.8 million tons of waste were disposed of in landfills in Germany in 2006, a decline of 15% compared with 2005. The number of landfills was down to 1,725 (2005, 1,948) (MENCNS, 2007a).

_Bavaria and Augsburg (Regulations)_

Major federal regulatory concepts in Germany are “Product Responsibility” and separate waste collection by households. According to the former, the polluter, i.e. the manufacturer, is responsible for the generated packaging waste (Packaging Ordinance of 1991); and by the latter, the government is responsible for the “near household collection.” The state of Bavaria has adopted the federal law, in some cases even tightened it, and is responsible for the enforcement throughout the state; some state laws include “The Bavarian Waste Management Act,” and the “Closed Cycle Management
and Waste Law.” Ideas such as “Circular Flow Management” and “Material Flow Management” are some Bavarian specific improvements of federal laws and regulations. As a result of this stringent policy, the amount of generated residual waste decreased in Bavaria between 1990 and 2007 by 135 percent; during the same period, the total waste generation in Bavaria was reduced by 11.4 percent (BSMEH, 2009).

Augsburg’s “Office of Environment” is the enforcement authority for state laws based on the regulations of the federal “Circular Flow Law” and the federal “Waste Law.” The municipal household waste management is one of its responsibilities.

Lincoln and Augsburg (Consumption, Waste Generation)

In this study, two components are utilized to show a relatively clear picture of consumption rates. The two components are, personal income, and net retail sales (sales tax in Augsburg). Inferring from the available data for Lancaster County from 2000 to 2007, a 21 percent raise in personal income is observable ($29,226 to $35,360). The Nebraska average was $27,622 and 36,372, respectively, a 31.6 percent increase (NDED, 2009a). Furthermore, the county had a 21.6 percent rise in retail sales between 2000 and 2007 (NDED, 2009b).

At the U.S. national level, between 2002 and 2008, a GDP rise of 36.35 percent in current US Dollars (World Bank, 2009), and a personal consumption expenditures (PCE) increase of 36.1 percent is observable (USDC, 2009). The PCE rate consists of durable goods (up 10.38%), nondurable goods (up 42.65%), and services (up 39.32%) (USDC, 2009).

Augsburg experienced a 2.5 percent increase in personal income from 2003 to 2006 (BOS, 2006), and a 27.6 percent increase in sales tax between 2000 and 2007 (BOS,
2009). At the national level, Germany had a 81 percent rise in GDP (in current US Dollars) and more internet users per 100 people (76.09) than the U.S. (72.35) in 2008 (World Bank, 2009). The national PCE rate in Germany shows an 11.4 percent increase between 2002 and 2008 (See Figure 11) (FOS, 2009).

![Figure 11. Private consumption at current prices in Germany, in billion Euros. FOS, 2009.](image)

Between 2000 and 2004, 74.6 percent (1,848,000 tons) of the generated waste in Nebraska (avg. 2,476,000 tons) was sent to landfills and 25.4 percent recycled; between 2007 (4\textsuperscript{th} quarter, 81,967 tons), and 2008 (2\textsuperscript{nd} quarter, 69,264 tons), Lincoln’s Bluff Road facility had a 18.38 percent increase in the amount of the landfilled waste (NDEQ, 2009g). Augsburg generated about 94,465 tons of household solid waste in 2007 (2.19 lbs per person per year- see Table 1), a marginal decrease of 0.9 percent, compared with 2004 (94,879 tons).
CHAPTER 5

Discussion

In comparing the political arena in Germany and the United States, the absence of a powerful “Green” party in the U.S. is the most important difference. Despite several federal legislation efforts in the United States, at the state and local level there are inconsistencies observable. The general approach in the U.S. waste management regulations is “to reduce;” the German concept, on the other hand, is based on “to prevent.” Another important difference between the two societies is the regulatory nature of waste management policies in Germany, and the anti-regulatory character of these programs in the United States. For instance, Subtitle D of RCRA recognizes that state and local governments are primarily responsible for planning, regulating, and managing waste. The voluntary nature of these regulations, especially in the area of solid waste management, is a major critical point in the U.S. In an analysis of the USEPA’s implementation of the Pollution Prevention Act of 1990, Burnett (1998) concludes that the USEPA’s efforts to shift to a pollution prevention regulatory ethic has had limited success. The USEPA must overcome a number of barriers such as the absence of mandatory timeframes for source reduction and command-and-control enforcement authority as well as the fragmented implementation scheme of national environmental regulation (Burnett, 1998). Rondinelli (2001) posits that the USEPA needs to use a wider array of policy, technical, and management instruments to become more pro-active in promoting pollution prevention and eco-efficiency.

In Germany, on the other hand, states follow the federal legislation in a more consequent manner, and apply merely some technical or organizational adjustments. The
“Unitarian” character of the German legislation system makes the German Federalism a special case. Furthermore, the regulatory role of the European Union is a decisive factor in solving environmental problems in Europe as far as the adjustments of national laws and regulations is concerned. These differences are probably important aspects reflected in laws and regulations.

Whereas the gathered data from German federal authorities are of high quality and precision, the acquired data from the USEPA is not as transparent and enlightening. Accessing the correct and specific U.S. data has been a major challenge in this study. For instance, USEPA does not separate single-family and multi-dwelling residences in its 2007 report; “sources of MSW, as characterized in this report, include both residential and commercial locations,” whereas the largest quantity of recovered materials comes from the commercial sector (USEPA, 2007b, p. 11). This line of thinking can also be observed in “The 2009 Statistical Abstract” of U.S. Census Bureau, where the amount of residential and commercial solid wastes, are combined (Census, 2009). At the state or local level, “all” collected recyclables are weighted and counted and the resulting data is aggregated to yield a “recycling rate” for the respective state (USEPA, 2007b, p.18). To acquire this data, the USEPA estimates “tons of materials and products generated, recycled, or discarded” (USEPA, 2007b, p.18). Local planners use the USEPA data to develop approximate estimates of total MSW generation in an area (USEPA, 2007b, emphasis added). To summarize, these procedures are not precise and do not reflect the actual amount of household recycling rates for the purposes of the present study.

The German data, despite the usual error factors inherent to such statistics, is extensive and detailed in a manner that research can have a relatively precise picture of
the general condition. For instance, the data on generated solid waste distinguishes
between residential wastes in general, and commercial-, and household solid waste
generation in specific. Within household data, there are several waste classifications. This
is mainly because of reporting measures required by federal law.

Van den Bergh (2008), postulates stringent policies in order to prevent the
increasing household consumption within the OECD countries. For instance, generation
of durable goods in MSW totaled 45.4 million tons in 2007 (17.9 percent of total MSW
generation). After recovery for recycling, 37.4 million tons of durable goods remained as
discards in 2007 (Table 4), (USEPA, 2007b). Whether Van den Bergh’s postulation in the
U.S. is reachable or not, depends on several economic and political factors. For instance,
as a result of the U.S. reluctance toward international climate protocols, such as the
Kyoto Protocol, no target-setting exist in the U.S. A comparison of CO₂ per capita
emissions between the United States (19.48 TMT¹³) and Germany (10.1 TMT) shows a
clear advantage for Germany (WRI, 2003).

Comparison, Lincoln and Augsburg

The two cities are in some aspects very similar (See Table 6). However, they are
different in their regulatory waste management framework. Some examples include,
household non-hazardous solid waste management is not regulated in Lincoln; for
instance the type or the color of waste containers are not specified in Lincoln’s Municipal
Code Book. This is not the case in Augsburg, where due to the regulatory concept of
“near-household-disposal” and the “4-Container-System”¹⁴ households are bound to
separate their waste. The role of the private sector is paramount in household SWM in

¹³ Thouand Metric Tons
¹⁴ Separation of packaging (yellow container), paper (blue container), residual waste (grey container), and
glass (in separate containers).
Lincoln; only two entities are directly operated by the city government and the rest consist mainly of private businesses and their relationship with households (e.g. curbside collection) is based on mutual business agreements; obviously, households are not obligated to recycle.

In Augsburg however, the mutual agreement exists between the city and households; the city is responsible for curbside collection. Private businesses (recyclers) operate, generally, after the waste is collected by the city. It is notable that in Nebraska, the Environmental Quality Council members represent mainly the private sector (NDEQ, 2009c); this is not the case in Bavaria and Augsburg; the responsible departments in Augsburg consist of government employees without any ties to the private sector. As a result of the German “Product Responsibility” concept and the federal refund system, plastic bottles, for instance, can be returned at any appropriate retail store and be refunded. This system does not exist in Lincoln (Nebraska). It is worth noting that this concept reduces the amount of landfill waste drastically, as shown in previous figures. Furthermore, data for Lincoln can be inferred from the national data, indicating a recycling rate of 33.4 percent for the U.S. in 2007 (See figure 4), and a 66 percent recycling rate in 2003 for Germany (WMW, 2006).

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15 Lincoln Bluff Road Landfill, and City of Lincoln Solid Waste Operation are the only public entities.
Table 6. General demographic information, Augsburg and Lincoln.

<table>
<thead>
<tr>
<th></th>
<th>Augsburg*</th>
<th>Lincoln**</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-64 years of age</td>
<td>106,159</td>
<td>189,829</td>
</tr>
<tr>
<td>1-person-households</td>
<td>61,781</td>
<td>30,233</td>
</tr>
<tr>
<td>persons/household</td>
<td>3.28</td>
<td>2.36</td>
</tr>
<tr>
<td>Population density</td>
<td>1792/km2</td>
<td>1166/km2</td>
</tr>
</tbody>
</table>


** U.S. Census Bureau, American Community Survey, 2005-2007

Also the consumption data in both countries can reflect the local situation. The 36.1 percent increase in the U.S. personal consumption expenditure between 2002 and 2008 (USDC, 2009), and the 27.6 percent sales tax increase in Augsburg between 2000 and 2007, demonstrate clearly the general tendency in both countries. However, despite the positive numbers and other statistical data in the present study, the amount of per capita waste generation in Germany has declined (See Figure 1); and in the U.S. it has not (See Table 5).

Implications for Practice

As mentioned in Chapter 1, the central aspect of the German waste management policy is “Product Responsibility.” This and “the law of circular flow” are the main contributors to Germany’s position in the world as a country with the highest recovery rates (MENCNS, 2007b). Although the term “Product Responsibility” is used in both governments and the concepts are nearly identical, in the case of USEPA, it remains as a
set of recommendation with voluntary character (USEPA, 2009c). In the U.S. target-setting and a step-by-step policy could be efficient; for instance, there is need for a federal bottle deposit rule as a mandatory measure for all states (Figure 10). Or in the area of packaging, federal packaging mandates in the United States are absent (USEPA, 2009c) and of great need. Volume-based pricing is another policy instrument that is in the right direction and contributes to citizens’ environmental awareness. In the area of landfilling, although the number of landfills decreased in the past 18 years, the average landfill size increased (USEPA, 2007b) (Figure 5). A major step toward sustainable waste management would be the downsizing of landfills and emphasis on other programs such as the 4-bin-system in Augsburg. Finally, another emerging problem in this study was data acquisition. Policy makers, researchers, the media, and most citizens need transparent, robust, and holistic data that is easy to access.

Implications for Research

The present study observed the non-regulatory character of household waste management in the US. The comprehensive historical, political, and social reasoning behind this approach is a paramount task for future research. In doing so, researchers should explore the obstacles in the way of policies such as manufacturer (product) responsibility, the “Polluter Pays” principle, or mandatory household recycling and separate collection.

Acquiring reliable and accurate data and statistical information was one major challenge in the present study. In case of the US, for instance, since areas such as landfill facilities or hazardous waste management are regulated, the availability of, and the access
to data was relatively convenient. In order to avoid inaccuracy and the resulting false conclusions, future research should have unlimited access to national, and specifically to state and local data and information. For instance, the present study attempted to compile elements such as personal consumption expenditure, or retail sales tax, to demonstrate the consumption “rate” for the purposes of the study. A more accurate data, based on official, governmental data sources would have been more desirable.

Certain questions remain unanswered such as, although the number of landfills in the US declined between 1989 and 2007 (USEPA, 2007a), the size of present landfills is not mentioned within the national data. This may imply that parallel to this decline, the amount of waste has also decreased, which, as shown in this study, is not the case. On the other hand, in both cases, Germany and the US, it would be productive to establish a correlation between the number of landfills and the amount of available area across the respective country.

Finally, including household non-hazardous solid waste in municipal solid waste (e.g. Figures 5 and 6), is a major deficiency in the US data acquisition that could be misleading. Although this is due to the non-regulatory character of waste management policy, it is future research’s task to, where possible, separate these data to obtain realistic information.

Conclusions

Changing purchasing behavior has greater environmental benefit than reusing or recycling available products (Steg & Vlek, 2008). Habitual behavioral patterns are sequences of behavior (Verplanken et al., 1998). Developing moral norms plays a crucial role in individuals’ behavior toward recycling. How these norms develop, depends on a
number of factors such as the society’s political structure, informal and formal education, and most importantly, in the field of pro-environmental behavior, the awareness of and knowledge about environmental problems (Bamberg & Möser, 2006). Those laws and regulations that encourage these behavioral sequences, and promote the social benefits of pro-environmental behaviors are the most effective and efficient ones. This is not necessarily in contrast to economic “growth,” as shown in figure 12.

![Decoupling the economy from waste “production” in Germany](image)

Figure 12. The relationship between economic growth and waste generation in Germany Office of Statistics, 2007.

On the contrary, individuals’ pro-active and responsible attitude toward their elected representatives can serve as a strong feedback for conceptualizing new laws and regulations toward a sustainable waste management policy. The waste prevention aspect of the German concept, coupled with recycling convenience and a rich experience in the field of political ecology, is a good example of this pro-active behavior.

In general, policy must communicate the benefits of recycling (economic, personal, social, and societal). Individuals must feel they can effectively contribute to
solutions rather than create general concern for environmental problems. It is important for public policy to study the determinants of consumer choice and public policy’s ability to influence those choices. As far as the instruments are concerned, a flat fee, for instance, does not promote a pro-environmental behavior. Increasing public awareness, on the other hand, is an important factor that has to be practiced, regardless of the specific waste management program.

The important constraints in the U.S. society toward a sustainable use of natural resources are of historical, social, and political nature (American individualism, community relationships, state autonomy etc.). The economic factor that values the “freedom” of the private sector in dealing with environmental issues is another U.S. specific mentality. In this context, federal government regulations in the U.S. have weaker impact on state policy. Federal mandatory incentives are powerful instruments in encouraging the private sector for more investment; on the other hand, similar incentives, such as encouraging waste prevention, or increasing the number of free containers in cities, may have a strong educational effect that might gradually change the people’s habits and behaviors in the long-term.
References


