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A COMPARATIVE STATE STUDY OF REDUCING LAND-BASED MUNICIPAL SOLID WASTE STORAGE: DETERMINANTS, POLICIES, AND FRAMEWORKS

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# A COMPARATIVE STATE STUDY OF REDUCING LAND-BASED MUNICIPAL SOLID WASTE STORAGE: DETERMINANTS, POLICIES, AND FRAMEWORKS

by

HUSEYIN OZGUR

Presented to the Faculty of the Graduate School of

The University of Texas at Arlington In Partial Fulfillment

of the Requirements

for the Degree of

DOCTOR OF PHILOSOPHY

THE UNIVERSITY OF TEXAS AT ARLINGTON

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April 9, 1998



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ABSTRACT

A COMPARATIVE STATE STUDY OF REDUCING LAND-BASED MUNICIPAL SOLID WASTE STORAGE: DETERMINANTS, POLICIES, AND FRAMEWORKS

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Supervising Professor: Joel B. Goldsteen

This study is a comparative state study of municipal solid waste storage and disposal. It integrates many environmental studies with comparative state policy analysis. Two closely related questions are examined: (1) Why and to what extent do states restrict land-based municipal solid waste disposal? (2) What factors and public policies do determine municipal solid waste landfilling rate? Landfilling rate is calculated percentage of solid waste not composted, incinerated or landfilled.

Thousands of landfills have been closed due to state and federal regulations and substandard conditions of old landfills. This closing has resulted in building larger regional or privatized landfills in the United States and pressures to find new sites or expand existing



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ones. A political and environmental crisis of solid waste now exists as a result of lack of landfill space.

Based on the statistical analysis of secondary source data from 50 American states (from three major sources: (1) Biocycle, (2) Green Index authored by Hall and Knerr, and (3) various articles and books in political science), the municipal solid waste landfill rate is related to the physical, economic, legislative conditions and capacities of the states, solid waste disposal issues, public opinion, and recycling programs and policies. Six theoretical constructs (6 models) show that the issue severity model plays a crucial role in determining the state landfilling rate. Finally, the last model is an integrated model containing variables from the other models. Results show that state economic and innovative capacities are negatively related to the landfill rate.



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# CHAPTER I

# INTRODUCTION

## Background of the Study

Land is an important natural resource in need of protection. For a long time, the United States has viewed as a country with much land. Contamination of land, negative externalities of land use and possible future land scarcities, at least in densely populated areas, only recently considered as important.

The lack of landfill capacity and skyrocketing disposal costs of the late 1980s and early 1990s is believed now over (Darcey 1992; Goldstein and Glenn 1997; Repa and Blakey 1996). It seems that the U.S. landfill crisis has shifted from an environmental crisis to more of a regional capacity crisis (Darcey 1992). Lodge and Jeffrey (1991, 128) stated that "the U.S. is running short of landfill capacity and local communities, states, and regions face mounting and critical environmental choices." Regionally, some parts of the country like the Northeast, NewYork-New Jersey, Florida, and Hawaii suffer from chronic landfill crisis (Goldstein and Glenn 1997; Repa and Blakey 1996).

It seems that when issue is limited to municipal solid waste disposal, there is enough suitable land nationwide for waste storage. With the disposal of other wastes (industrial, mining, and agricultural solid wastes, hazardous wastes, sewage and sludge) land-based waste disposal and its adverse impact on land, water, and air reaches critical levels.



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Municipal solid waste is a small portion (200 million tons) within the annual 8 billion tons of solid waste stream. Disposal of municipal solid waste gets attention because of its high visibility (curbside collection, recycling bins, municipal solid waste landfills) by laypersons as compared with other wastes.

Not only are landfill capacity but environmental and health impacts of solid waste landfills also are of great importance (Denison and Ruston 1997). Reese (1983, 288) stated that waste disposal and its land use problems are major pollution concerns. The Office of Technology Assessment (1992) repeatedly emphasizes the difficulty of siting new landfills and the need to conserve landfill space. With the fear of water pollution from landfills, many residents are concerned about old and new landfills. States respond with bold programs to land-based solid waste disposal issues.

Hird (1994) emphasized that more sites are added to the Superfund national priority list every year than are sites cleaned up. Nearly 20 % of the Superfund national priority list sites are old landfills. The long-term costs and environmental issues raised by land-based solid waste disposal can be high in future. Lawrence and Khurana (1997) studied public policy concerns and financial reporting issues related to municipal landfills for which Superfund settlements have occurred; and, they concluded that environmental liabilities do represent a serious threat to the financial health of some municipalities.

In 1960 an estimated 30 % of municipal solid waste generated in the United States was combusted in old-fashioned incinerators without energy recovery. When pollution controls began to be required, the old incinerators that did not meet the new standards were phased out (Kreith 1994, 3.28-3.29). In the 1960s and 1970s, a large percentage of MSW

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burned. The remainder was dumped and often it was burned at the dump to reduce its volume. Historically, through the mid-1980s, incineration declined considerably and landfills became difficult to site, waste generation continued to increase and the burden on the nation's landfills grew dramatically. As a percent of total generation, landfilling has consistently decreased from 83.2 % of generation in 1986 to 56.9 % in 1995 (USEPA 1996, 113-14). "Stimulation provided by state waste reduction legislation in recent years has been causing the landfilling rate to decline and increased use of alternatives such as recycling and composting." (Kreith 1994, 5.2)

## Purposes and Importance of the Study

The first purpose of this dissertation is to examine the reasons why all the states try to reduce land-based solid waste disposal. The second purpose of this dissertation is to find determinants of landfilling rate. Alternative solid waste disposal policies are incorporated into the history of solid waste regulation. History of solid waste disposal practices and regulation as well as examination of important solid waste disposal issues help to understand the underlying reasons of reducing land-based solid waste disposal. State landfilling rate is hypothesized to be a function of issue severity, state institutional capacity, liberalism, public opinion, and recycling commitment.

States exhibit a significant amount of variation in the landfilling rate, making this policy area an excellent laboratory exercise for comparative policy analysis. State programs must meet federal minimum requirements, but few barriers prevent states from creating regulations that exceed these standards (Ringquist 1993a, 321). USEPA believes that a 25 %

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recycling rate is optimal. While few states have less than a 50 % landfilling rate, few others have more than a 90 % landfilling rate.

States have three levels of control affecting their role in managing municipal solid waste: (1) States cannot regulate to control or limit population, nor can they change their geography; therefore, states have little control on physical space and demography related waste storage problems. (2) States have very limited control, which only can be achieved in the long-term, on their institutional capacity. (3) States have greater control on recycling policies and programs. Limited institutional capacity may become a burden in implementing regulations and recycling programs. States have limited control over some factors but not others. The percentage of solid waste landfilled is dependent on both state policies and uncontrollable factors such as the level of waste issues. Knowing what factors affect states' landfilling rates, state policymakers may create more workable and efficient waste disposal policies.

Political scientists have sought to explain the variation in state environmental protection policies. Such information from comparative state environmental policy studies, including this study may prove useful in two respects. First, from a purely pragmatic point of view, understanding specific reasons for formulation of particular solid waste management strategies like mandating recycling programs may stimulate inactive states to be more responsive to environmental concerns. Second, from academic perspectives, it is interesting for academicians to understand how and why states implement particular solid waste disposal policies (Lester 1990). It is interesting to underline the reasons of the policies implemented and policy output differences among the states. Policymakers and policy implementers need

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to understand factors affecting state solid waste disposal. Academically, knowledge generated in this study about theories to explain landfilling rate can be used to understand other environmental studies.

## Research Questions

There are two research questions: (1) Why and to what extent do states restrict land-based municipal solid waste disposal? To answer this research question, the historical and regulatory background of municipal solid waste disposal (chapter 2) and major solid waste disposal issues (chapter 3) are examined. (2) What factors do determine landfilling rate? Landfilling rate is calculated as the ratio of municipal solid waste goes to landfills versus alternative disposal methods (incineration, recycling, and composting) at the state level. Four theoretical constructs (issue severity model, state institutional capacity model, public opinion and liberalism model, and recycling commitment model) are used to answer this research question.

## Indicator (Dependent Variable)

The dependent variable in this study is the percentage of municipal solid waste landfilled versus other disposal methods (incineration, recycling, and composting). The percentage of municipal solid waste landfilled varies from 17 % (Connecticut) to 96 % (Wyoming). Monthly professional magazine *Biocycle* and some other organizations like Environmental Industry Association break down the percentage of municipal solid waste disposal starting with 1989. The 1996 landfilling rates from the April *Biocycle* issue are used in the statistical analysis.

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In Public Administration Review 1991, Folz and Hazzlett used recycling rate and recycling participation as their dependent variables in measuring local government success of recycling practices. Recycling rate was used in few other studies as the dependent variable. Landfilling rate has been used as one of the three indicators of municipal solid waste management in recent USEPA reports.

## Issues of Land-Based Municipal Solid Waste Disposal

Land is an important natural resource that needs to be protected (Reese 1983, 288). Solid waste disposal practices resulted with costly negative externalities like pollution of water with leachate from landfills. Not only groundwater, but also land is contaminated and toxic materials are released to air, water, and land from waste disposal facilities. Now, as a result of past practices, federal and state governments (together with private entities) have spent billions to clean inactive leaking municipal waste storage sites under the Superfund program (Hird 1993; Lawrence and Khurana 1997).

### Finding Adequate and Environmentally Safe Landfill Sites is Difficult

Most of the countries have regional or community scale landfill capacity problems. For example, the number of landfills in the United States declined from 20,000 in 1978 to nearly 3,000 in 1996 (Goldstein and Glenn 1997). Shortage of landfill capacity is very acute in some parts of the country, especially the Northeast. The sharp decline is the result of landfills either reaching their capacity or closing because they do not meet county, state, or federal landfill standards, which increase the cost of designing, running and closing landfills (Ackerman 1997; Kovacs 1993). New landfill design and regulations cause existing landfills

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to fill up quickly. For example, government regulations typically require that each days' garbage must be covered with at least six inches of soil, which consumes as much as 30 % of landfill capacity (Finegan 1990).

## Landfill Costs are Increasing and Distribution of Landfills is Uneven

Landfills have become increasingly more expensive, owing to the rising costs of permits, construction, and operation. In other words, new federal legislation to protect environment and health has increased the costs of building and operating landfills. Increasing costs, together with very limited landfill capacity, force many densely populated cities to ship their waste to distant privately owned super dumps where lower tipping fees attract them (Wilt and Davis 1996). An estimated 16 million tons of municipal solid waste travels across state lines each year. The problem is expected to continue in the future.

Landfills across the country have been filling up. Therefore, communities and private waste companies have been searching for new places to bury their garbage. They have been looking at places like South Dakota, where the air, water, and soil have not been polluted yet. Some poorer distant local communities may be willing to take tremendous amounts of garbage in exchange for money. States and local governments are almost powerless to stop the flow of garbage across their borders (Wilt and Davis 1996). One waste company had tried for many years to open a huge landfill in South Dakota that would hold nearly twice as much municipal solid waste as the entire state produces.

The inadequate local landfill capacity and uneven distribution of landfill capacity are major issues in many states. For example, the remaining years of landfill capacity is more

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than 13 in Illinois and Texas (Texas Center for Policy Studies 1995). Ten or more years of landfill capacity is assumed to be long enough for American states. More than half of the counties in both states has no landfills. The number of active nonhazardous (municipal, industrial, construction and demolition) solid waste landfills in Illinois had fallen from 146 in 1987 to 59 in 1994 (Illinois Environmental Protection Agency 1996). Since 1987, the annual waste landfilled has decreased by 3.1 million cubic yards, or 6 %. In Illinois, problems in waste handling capacity during the next five years are more likely to occur at local or regional levels, rather than as a statewide disposal crisis. In 3 years, 72 counties in Illinois will be without a landfill if no new capacity is built (Biocycle 1996, 10; Illinois Environmental Protection Agency 1996).

## The Public Opposes to Landfill Sites

The failure to site new landfills is caused by the unwillingness of residents to accept nearby waste facilities. In the 1980s, it became difficult to find sites for new dumps when old ones reached the end of their natural lives. Public controversies and complex design requirements have directly affected the length of time to site new landfills and the costs of building them. For example, it took five years to start building a new landfill to replace the existing Halifax-Darthmouth Metropolitan Area (Canada) landfill. It is not unusual to take ten years or more to gain permit approvals, not because of the technical process, but because of public opposition. When a landfill may pose public health risks, the permit process becomes lengthy, controversial, and costly. Therefore, many private companies seek locations in lower income, poorer small communities, where public resistance may be more limited.

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## Landfills Can Cause Groundwater Contamination

Groundwater is one of the major sources of drinking water. Nearly half of the country's population obtains its drinking water from groundwater. Groundwater has also been used extensively for agricultural, industrial, and recreational purposes. Landfills cause contamination of this valuable resource if they are not designed to prevent leachate releases. Cleaning up contaminated groundwater is extremely costly; and, there is no proven technology. Therefore, federal and state regulations are designed to ensure that new or expanded landfills do not contaminate groundwater.

If the landfills are not properly designed, built and managed, runoff and leachate can contaminate surface water and groundwater supplies (Information Plus 1994, 15). Leachate can contain a broad range of chemicals, including metals such as lead, cadmium, mercury, and organic chemicals such as benzene. Precipitation levels, site topography, facility design and operation, and the type of final vegetative cover influence the amount of leachate generated by a landfill.

To lower environmental and health risks posed by leachate, landfills that receive waste must now install a groundwater monitoring system and set aside money to pay for groundwater cleanup. In 1993, fewer than 1,500 of the 5,800 operating landfills had groundwater monitoring systems and only about 900 had liners. As of late 1980s, many of the estimated 93,500 landfills potentially contaminated groundwater because of their locations on marshlands, former strip mines, or limestone sinkholes. It is also estimated that there are more than 20,000 abandoned leaking waste storage sites across the United States (with groundwater contamination occurring at a majority of those sites).

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## Main Hypotheses

There are four main hypotheses. These are:

(1) Severity and pressure affect state landfilling rate. (a) The higher the severity of the solid waste issues in the near past, the lower the state landfilling rate. (b) The more pressure from the population and the lack of physical space for landfills, the lower state landfilling rate.

(2) Institutional capacity negatively affects state landfilling rate. In other words, the higher the institutional capacity, the lower the state landfilling rate.

(3) The more liberal the state's public and representatives (policymakers), the lower the landfilling rate.

(4) The more committed the state to recycling, the lower the state landfilling rate. Each hypothesis referred to the one theoretical construct discussed in the order given. Each theoretical construct (model) consisted of several concepts to test. For example, state institutional capacity model consisted of such concepts as economic-fiscal, legislative-political, innovative, and administrative-bureaucratic capacities.

## Theoretical Constructs (Models)

### Introduction to Theoretical Constructs

Theoretical constructs (models) in this study are: (1) issue severity, (2) state institutional capacity, (3) liberalism and public opinion, and (4) recycling commitment. State solid waste handling methods are affected by these factors. States have different levels of responses -policies and programs- to the lack of land area for waste sites. Adoption of

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policies and programs depend upon pressure from public opposition and state physical conditions. State institutional capacity also affects the level and quality of state responses to solid waste disposal issues. Some states like California, New Jersey, Minnesota, and Oregon respond quickly and effectively to both the issue of declining landfill capacity and possible negative externalities of solid waste disposal. Others, like Louisiana and Ohio, are less eager to attack solid waste problems because of their relatively limited state institutional capacities in spite of their willingness to promote solutions.

Disposal practices, such as landfilling require special land areas and adversely affect adjacent land. Moreover, many localities or regions have a problem finding nearby place to locate a landfill. For these reasons, many states claim the need for alternatives to land-based disposal of municipal solid wastes. Among the alternatives, recycling is the most frequently utilized. Recycling is also accepted as less polluting than incineration and landfilling. Therefore, a recycling commitment model was created in this study.

## Theoretical Construct: Issue Severity

Federal policymakers responded with new and stricter legislation to the severity of the solid waste issues. The most significant regulation was the Resource Conservation and Recovery Act of 1976 (RCRA) and its amendments. As a result of this legislation, more than 17,000 landfills have been closed during last two decades. Both closure of landfills and public opposition to landfills create pressures to find alternative disposal methods. Pressures from solid waste and other environmental issues force states to promote alternative disposal methods: incineration, composting, recycling, and source reduction. Recycling is the most frequently used method to reduce the dependence on landfilling in solid waste disposal. All

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states have more or less focused on recycling and source reduction together with various regulations to decrease landfilling and preserving potential land for future final land-based disposal of solid wastes.

History of solid waste management, as well as theories and empirical findings of comparative state environmental policy studies, indicate that scarcity and cost of available land and the pressure of environmental issues affect state policy outcomes and outputs. As early as 1975, Mahajam and Agarwal emphasized the importance of the scarcity and severity of the issue on the adoption of environmental policies. Game (1976) found that some states heavily focused on air pollution due to high air pollution. Jones (1976), Wenner (1976), and Lester et al. (1983) indicated that the strength and the amount of legislative activities were related to the severity of the environmental issues. Lester et al. (1983) found that states with larger hazardous waste problems responded with stronger regulatory programs.

Regens and Reams (1988, 65) found that severity of the groundwater pollution increases the likelihood of states to more effectively use existing authorities, as well as creating new policies to protect their groundwater resources. They also indicated that technical pressures or the severity of the groundwater issue increased the tendency to foster the adoption of regulations. Regens and Reams (1988), and Lester and Lombard (1990) called upon other researchers to find better indicator variables to measure issue severity.

Ringquist (1994) used per capita production of hazardous wastes and the number of Superfund National Priority List (NPL) sites in each state as measures of issue severity. Ringquist (1994, 32) hypothesized that responsive and responsible state governments should be enacting more stringent programs where the threat of waste contamination is most severe.

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Consistent with this assumption, he found that states regulate in response to the amount of hazardous waste or water pollution. Ringquist (1994, 39) found that environmental pressures and organized interest groups are the most important factors in determining the strength of state water pollution control regulations.

The level and type of political response to landfill issues by states to solid waste issues are dependent on a number of factors. States may not have enough land suitable for the storage of solid wastes. Some states are not able to bear the costs or to overcome the potential public opposition to solid waste disposal facilities. In this dissertation, it was assumed that there is a negative relationship between the solid waste disposal issues and state landfilling rate. However, states with high land-based solid waste disposal issues but low institutional capacity may not achieve low landfilling rates due to limitations of their institutional capacities. In the case of past land-based solid waste issues, states may adopt regulations more in favor of source reduction, recycling, composting, and incineration. Finding appropriate issue severity indicators to test state landfilling rate is an important consideration in this study.

## Theoretical Construct: State Institutional Capacity

State institutional capacity seems important in understanding and explaining landfilling rate. The concept of state institutional capacity was borrowed from Davis and Lester and expanded by adding innovative capacity. Davis and Lester (1989, 7) defined the state institutional capacity as "the ability and willingness of public officials within a given jurisdiction to develop and administer public policies." Their state institutional capacity consisted of only three dimensions: economic, political, and managerial. State innovative

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capacity was added as the fourth dimension to state institutional capacity. The four dimensions of state institutional capacity in this study are: (1) economic-fiscal capacity (strength), (2) legislative-political capacity, (3) innovative capacity, and (4) administrative-bureaucratic capacity.

Williams and Matheny (1984), and Lester et al. (1983) were among the first to use state institutional capacity in comparatively analyzing 50 states' environmental policies. A number of researchers of state environmental policies concluded that wealth accounts for a significant amount of the variance in state efforts to protect the environment (Lester et al. 1983; Lester and Keptner 1984; Williams and Matheny 1984). In line with these previous findings, in this study, it is hypothesized that economic and fiscal resources are negatively correlated with landfilling rate.

Innovations and environmental initiatives, a dimension of state institutional capacity, may play a major role in determining landfilling rate. For example, recent innovations contributed in creating more durable, reusable, lighter, and recyclable materials. The more recyclable materials in solid waste stream, the lower landfilling rate can be expected.

One of the most frequently used dimensions of state institutional capacity is legislative professionalism. There are different measurements of this concept (dimension). In general, legislative professionalism is considered as part of the political model not as a dimension of institutional capacity. Bowman and Kearney's (1988) state legislative professionalism index is used in this study.

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## Theoretical Construct: State Public Opinion and Liberalism

Different political attributes or ideologies of legislatures measured as League of Conservative Voters environmental commitment score, and public opinion measured as general policy liberalism factor score by Erikson, McIver , and Wright (1993) are expected to be associated with state landfilling rate.

General policy liberalism measured by Klingman and Lammers (1984) and the relative liberalism of the public's ideology (opinion) measured by Wright, Erikson, and McIver (1985 and 1987) affect the nature and strength of state policy responses. Regens and Reams (1988, 65) found that general policy liberalism negatively correlates with groundwater protection policies.

## Theoretical Construct: State Recycling Commitment

Most of the practitioners and legislators in solid waste management see recycling as a promising alternative to reduce landfilling rate. It seems that there is a relationship between the strength of recycling programs and landfilling rate. In this dissertation, it is expected that the extent of local and state recycling programs affect state landfilling rate. Recycling rates were compared among the states and related to land-based solid waste storage.

Few political scientists working in environmental regulation field seem to believe that truly effective environmental regulation is very unlikely, if not impossible (Bardach and Kagan 1982; Lewis-Beck and Alford 1980). In other words, a group of political scientists content that environmental regulation simply does not work. A small group of other researchers like Evan J. Ringquist (1993c, 1023) believe that regulation does work. Existence of disposal bans was used in this dissertation to statistically test whether there is a

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relationship between particular environmental regulations and landfilling rate. In other words, it is hypothesized that particular solid waste management regulations affect both directly and indirectly a state's landfilling rate.

Early regulations of municipal solid waste addressed the negative externalities associated with various disposal methods. In the 1980s, legislation was directed at controlling the disposal of the waste stream. In the 1990s, attention shifted toward legislation that encouraged the demand for recyclable materials, including tax credits and minimum content laws. Recent federal and state legislation focuses on procurement policies and disposal bans. Banning specific items from landfills and incinerators is one of the most frequently used regulations in solid waste management. Disposal bans may focus on either reducing toxicity (e.g., battery ban, used oil disposal ban) or volume (e.g., yard waste ban) of the solid wastes. Yard waste bans, white goods bans, and tire bans are important from a volume perspective; used oil, battery ban, and household hazardous waste bans are important from a toxicity perspective.

Higher recycling rates at reasonable cost and ease can not be achieved only by relying on disposal bans. Comprehensive recyclable collection programs and adequate recycling markets also are required. Source separation (prevents contamination and makes recycling easier), density, participation, and technical design of recycling programs also impact recycling rate. Recycling rate is negatively related to landfilling rate. Similarly, indicators of state recycling commitment model are hypothesized to be negatively related with landfilling rate. Yard waste disposal ban, population density, percent of people served by recycling programs and number of paper and pulp mills ranked by states are used as independent

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variables. This research should contribute to understanding the impact of environmental regulations and recycling efforts in managing land-based disposal of solid wastes.

## Statistical Analysis Methods

Both research questions in this study are related. The first research question (why and to what extent do states restrict municipal solid waste landfilling) is analyzed first. Second, factors affecting landfilling rate are analyzed. Independent variables as listed in chapter 9, table 3 are used to test the relationships between landfilling rate and 4 models (issue severity, state institutional capacity, liberalism and public opinion, and recycling commitment).

Multivariate regression analysis was performed to examine the relationships between dependent variable and independent variables. First, each theoretical construct and their associated hypothesis were separately tested by using multivariate regression analysis. Then, the theoretically stronger independent variables from each limited theoretical constructs selected for the integrated model. The final integrated model consists of the theoretically strongest independent variables from each model. Few state level policies, like yard waste ban, were statistically analyzed by using dummy variables (1 for presence of yard waste disposal ban, and 0 for absence).

## Organization of the Study

Chapters 2 and 3 answer to the first research question: Why and to what extent do states restrict land-based municipal solid waste disposal? Examination of issues and regulations of land-based solid waste disposal also provides some background for the issue severity model, one of the four major theoretical constructs used to answer the second

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research question (determinants of state landfilling rate). In other words, chapters 2 and 3 of this dissertation provide a general background to each of the two research questions and answer the first research question.

Chapter 4 provides a discussion on traditional, emerging, and integrated theories of environmental policies. This is considered important in this dissertation because traditional (economic capacity) as well as emerging theories (issue severity) and integrated theory are used to examine state landfilling rate. Chapters 4 through 8 provide theoretical background and literature review with significant findings to answer the second research question. After discussing land-based solid waste disposal issues, each theoretical construct was introduced in a separate chapter. Independent variables and concepts for statistical testing associated with each theoretical construct are discussed in the respective chapters. Discussion of independent variables is arranged differently in each chapter. Variables in chapters 5 (issue severity) and 8 (recycling commitment) are discussed at the end of these chapters under the section of "theoretical construct." Variables in chapters 6 (state institutional capacity) and 7 (public opinion and liberalism) are discussed throughout the chapters. A brief list of independent variables also is provided at the beginning of chapter 9.

Chapters 9 and 10 of the study focus on reporting statistical analysis results, discussing and relating results with previous findings. Chapter 11 summarizes findings, gives recommendations and policy suggestions, points out future research, and integrates various solid waste disposal methods.

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# CHAPTER II

# HISTORICAL DEVELOPMENT OF SOLID WASTE DISPOSAL

The history of land-based solid waste disposal practices, and regulations of federal and state governments are discussed at the beginning of this chapter. Then, composition and generation of solid waste trends are presented. Historical development of sanitary landfilling and incineration also are summarized. Finally, a short discussion is made about privatization, regionalization, and incineration of solid waste disposal, which are increasing as a result of stricter state and federal regulations.

## Land-Based Solid Waste Issues and Practices Are Related to Significant Federal and State Regulations

Federal and state statutes concerning solid waste affect solid waste landfilling in particular and solid waste management in general. The relationship between solid waste practices and federal and state regulations are two-way: Solid waste practices impact regulations; and federal and state regulations cause changes on solid waste practices and technology. The most effective and important of various federal regulations concerning solid waste disposal seem to be the Resource Conservation and Recovery Act (RCRA) of 1976 and its amendments. Therefore, regulations of solid waste management are divided into two main time periods as discussed below -before and after the RCRA.



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## Major Federal and State Regulations of Solid Waste Disposal Before the RCRA of 1976

The modern conception of solid waste management first emerged in the 1890s under the influence of the sanitary reform movement and the municipal reforms associated with the Progressive Era. The sanitary problems generated by the rapid industrialization and urbanization of the second half of the nineteenth century got attention from the Progressive Era reformers. Reformers in many urban centers began to lobby for municipal control over the collection of urban wastes. Prior to that point, waste had been viewed largely as an individual rather than governmental responsibility.

### *Earlier Intervention on Solid Waste Disposal*

The first limited governmental intervention on solid waste collection and disposal in the United States started in Washington D.C. In 1795, the Corporation of Georgetown (Washington D.C.) enacted a law prohibiting the disposal of garbage in the streets assuming individual responsibility rather than governmental responsibility to keep streets clean and get rid of garbage. This law required individuals to either carry away garbage themselves or to hire a private carter. In 1800, President John Adams hired a private carter to haul garbage away from the White House, but it was not until 1856 that Washington had a city wide garbage collection system supported by taxes (White 1983). Neither of these early laws requiring garbage collection nor regulations in the first half of the twentieth century later influenced solid waste disposal.

Consistent with lack of governmental intervention to solid waste collection and disposal, as late as 1880, according to census figures, only 43 % of all cities provided some

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minimum form of collection. In other words, more than half of the American cities had no systematic garbage collection. Lack of public intervention to the steady accumulation of garbage in the streets reportedly inhibited the development of the U.S. disposal technologies in contrast to those Europe during the late nineteenth and early twentieth centuries in spite of pressure by higher per capita generation of waste in the United States (see Blumberg and Gottlieb 1989, 5-6). Despite the high generation of waste, unreliable waste disposal technologies, and efforts of reform movement advocates, more than half a century was needed to take precautions and focus on problems of waste disposal issues.

Starting with 1880, the issue of whether or not solid waste collection and disposal were the responsibility of any government were discussed by municipal reform advocates. Advocates of the reform movement focused on efficiency and importance of governmental intervention on municipal solid waste collection systems. With the popularity and influence of home rule provisions, more cities accepted the responsibility for waste collection and disposal as part of their municipal function. Melosi (1981, 232-37) noted that municipal authorities actively discouraged state legislatures from interfering in sanitation services and especially tried to gain and maintain control over city health departments. Municipal discouragement of state intervention deferred state involvement in solid waste collection and disposal for several decades.

The first major federal government intervention in solid waste disposal started in the middle of the 1960s. Involvement of states in solid waste disposal started one decade later just before the enactment of the RCRA of 1976. During the 1980s, virtually all states had established rules and regulations about solid waste disposal due to the requirements of

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various federal statutes. Not only state involvement, but also federal government initiatives in solid waste management, were very limited until the middle of 1970s. Early federal regulation of waste disposal (1899 and 1908) was based on the concern of the need for navigable waters for ships but not on the health and environmental impacts of dumping waste in rivers and oceans.

By the turn of the century, a variety of waste disposal practices were adopted by municipalities, ranging from land and water disposal (including ocean dumping) to incineration, reduction, or some combination of these methods. Among the disposal methods water and ocean dumping were heavily criticized because they caused pollution of surface waters not only in the community where waste was disposed, but also in neighboring and downstream communities. Advocates of the public sanitarian movement emphasized possible public health impacts, while the federal government was basically concerned with safe navigation. Finally, the practice of ocean dumping of municipal solid wastes was banned in 1933. Industrial and commercial wastes continued to be dumped into the oceans. Identifying streams and other water sources as nature's sewers was justified by economic interests. Municipal officials and engineers could not stand against economic interests (Blumberg and Gottlieb 1989, 7).

Most sanitary engineers preferred either incineration or reduction as major disposal methods, hesitating to use land-based disposal methods because of apparent negative health and environmental effects. Blumberg and Gottlieb (1989, 7-16) reported that sanitary engineers dominated waste management decisions from 1890 to the 1930s. The garbage issue, appeared to be under control during the 1950s and 1960s, seemed to be reviewed by

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sanitary engineers, municipal officials, and other policymakers (Blumberg and Gottlieb 1989, 7-16). From the beginning of the World War II to 1965, saliency of the garbage issue was low, and little attention was paid to solid waste disposal by any governmental institutions or group of officials.

A report issued by the Bureau of Solid Waste Management indicated that the rising urban population and entrance of new chemicals into the waste stream during the 1960s resulted in hard-to manage problems. The expertise and knowledge of sanitary engineers and capabilities of municipal governments were inadequate to solve these problems. The waste handling resources and facilities of most of the communities in the nation could not address the problems due to increasing cost of urban land, early signs of negative public reaction, and technological shortcomings of the disposal methods. Increased generation of wastes and the hazards of both land-based and incineration disposal methods were emphasized during the 1960s. Health and environmental problems were linked to the waste disposal. According to the Bureau, 94 % of all land disposal operations and 75 % of incinerator facilities were clearly inadequate in terms of air and water pollution, insect and rodent problems, and physical appearance. Thus, open dumping and incineration were of particular concern (Blumberg and Gottlieb 1989, 17).

The growing complexity of the solid waste problem and the issue of responsibility for solid waste management forced many cities to get help from federal and state governments. The federal government's increasing interest in the waste problem became noticeable in the 1960s. Before that time, it had been restricted to a small group of researchers in the Public Health Service, who conducted modest investigations on the relationship of sanitation

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services and public health. These researchers also provided information to the military for developing programs about disposal of wastes at federal installations (American Public Works Association 1976, 453).

As a response to early concerns raised during the 1960s about solid waste disposal, the 1965 Solid Waste Act became law, but had little impact on solid waste management in any level of government. Until 1969, the role of federal government in environmental policymaking was sharply limited with the exception of public land management. Air, water, and land pollution, which were considered strictly a local matter, were not prominent issues on the agenda of national government and states. Solid waste disposal emerged as a significant national problem when it was linked with other forms (e.g., air, water) of pollution.

In 1965, the solid waste disposal issue received better recognition by federal government. In a special message on conservation and restoration of national beauty, President Lyndon B. Johnson called for a better solution to the disposal of solid wastes and recommended federal legislation to assist state governments in developing comprehensive disposal programs and to provide research and development funds. Following his recommendation, Congress passed the Solid Waste Disposal Act of 1965 - interestingly, as Title 2 of the 1965 amendments to the Clean Air Act. The Disposal Act recognized the ever-mounting volume and changing character of waste. It also noted the inability of current methods to deal with the problem and the failure of resource recovery programs to economically convert waste into usable byproducts (Melosi 1981, 199-200).

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The primary thrusts of the Act were to initiate and accelerate a national research and development program and to provide technical and financial assistance to state and local governments to create interstate agencies for the planning, development, and conduct of disposal programs. The Solid Waste Disposal Act represented the first significant recognition of refuse as a national issue focusing primarily on disposal of waste rather than collection or street cleaning. Not satisfied with legislation alone, President Johnson, with the advice of his Scientific Advisory Committee. directed that a special study be made of the nation's solid waste problem. As a result, the 1968 National Survey of Community Solid Waste Practices was produced.

To refine the 1965 act, Congress passed the Resource Recovery Act in 1970. This piece of legislation provided two important contributions or changes as compared to the 1965 act. First, it shifted the emphasis of federal involvement from disposal to recycling, resource recovery, and the conversion of waste into energy. Second, it stimulated a national system for storing and disposing of hazardous wastes (Melosi 1981, 201). Subsequent laws, such as the Resource Conservation and Recovery Act of 1976, were built upon the 1970 act. Federal legislation passed in 1965 and amended in 1970 with new provisions gave the federal government a clearly defined role for the first time. The federal government, then, began to support projects and research for the development of the new technologies regarding storage and disposal of hazardous and solid wastes (Blumberg and Gottlieb 1989, 18).

The administrative structure established to oversee the implementation of the federal refuse program was as important as the new legislation. At first, too little attention was given to this aspect of federal involvement, and responsibility was passed from agency to agency.

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USEPA, created in 1970, assumed responsibility for most hazardous and solid waste activities. Therefore, a single headed agency, created exclusively to manage environmental issues, raised expectations to solve the waiting problems of waste management. In the 1970s the Office of Solid Waste, a department of the USEPA, acquired the authority to conduct special studies related to solid waste, to award grants, and to publish guidelines (APWA 1976, 453; Melosi 1981, 201). Although the establishment of the Office of Solid Waste provided a degree of stability and permanence for federal solid waste programs, in the mid-1970s the USEPA proposed a drastic cutback in the federal solid waste program and recommended that federal activities be limited to regulating hazardous wastes. This caused opposition from Congress, state, and local groups. As a result, USEPA announced its willingness to continue to develop and promote resource recovery systems and technology (Melosi 1981, 202).

### *Earlier State Involvement in Solid Waste Disposal*

> At the time of the passage of the Solid Waste Disposal Act of 1965, there were no state-level solid waste agencies in the country, and only five states had employees are assigned to any phase of solid waste management. Four and a half-years after the first grant of technical assistance was awarded, fourty-four states had active programs (Van Tassesl 1973, 468 cited in Melosi 1981, 202).

Blumberg and Gottlieb (1989, 19) mentioned that "partly as a result of growing community pressure, some limited local and state measures such as packaging review ordinances were developed to address the extraordinary growth of the waste stream". However, these local and state measures were criticized heavily by legislatures. A strong counterattack by the packaging, petrochemical, and beverage container industries led to an

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important modification of these measures. Industry and government officials made some criticisms about production choices, placing responsibility on the individual consumer.

This concept of "blame the victim" was emphasized by one of the advocates of environmental legislation, Edmund Muskie (D-Maine), a prominent Senate environmental leader during the late 1960s. Muskie, who helped steer the 1970 solid waste legislation, the Resource Recovery Act, through Congress, wrote that "it was easy to blame pollution only on the large economic interests, but pollution is a byproduct of our consumption-oriented society. Each of us must bear his share of the blame" (Blumberg and Gottlieb 1989, 20). Also, the traditional conservationist groups and even many of the newly emerging environmental organizations attacked the individual choice of consumption and increasing population because it was considered the main cause of solid waste problems.

Despite the fact that prior to the enactment of the RCRA in September of 1976 there were several federal statutes concerning solid waste, none of the statutes mandated or offered any guidance as to how solid waste problems could be managed. Hazardous wastes were not a major concern in the Solid Waste Disposal Act. In addition, Section 208 of the Federal Water Pollution Control Act (1972) affected solid waste planning through water pollution control activities authorized by the Act (Kovacs 1986, 9). The Solid Waste Management Act of 1965, as amended by the Resource Recovery Act of 1970, provided technical and financial assistance to state and local governments in the planning and development of resource recovery and other solid waste disposal technologies. Such legislation affirmed reliance on local and state action for coping with solid waste problems.

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As Kovacs (1986, 9) noted that "by 1975 the incentives provided under the Solid Waste Disposal Act and the Water Pollution Control Act encouraged 48 states to adopt some form of solid waste management program." He also reported a greater difference in state programs in terms of staffing (from few to many persons) and operation budgets (ranging from zero dollars to 1.2 million dollars).

By mid-1975, all the states but Wyoming had enacted solid waste management legislation to comply with federal law. As a result, solid waste was no longer an exclusively local issue. The involvement of state and federal governments began to offer hope for directing expenditures of funds, research and administrative activities in a more comprehensive way. At the same time, it also led to confused and complicated questions of jurisdiction and responsibility for collection and disposal (Melosi 1981, 202-03). To resolve this issue, Congress passed the 1976 Resource Conservation and Recovery Act, which created a federally imposed cooperative federalism in waste management.

## Major Federal and State Regulations of Solid Waste Disposal After the RCRA of 1976

The 94th Congress was approached by municipalities, as well as environmental, public interest, and industry groups about the lack of landfill capacity and its impact on municipal government, environmental protection, and industrial expansion. The problem was not viewed as an immediate threat to public health and safety, but rather as a future threat to the health of the nation.

In the past twenty years, a substantial body of state and federal legislation regulating the disposal of industrial, hazardous, and municipal solid wastes has been developed. Before

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that time, solid waste management was based on the judgment and decision of individuals or local health and sanitation departments. No distinction was made between industrial and municipal solid wastes. Significant federal regulations governing the disposal of nonhazardous and hazardous waste did not go into effect until 1976. Concerns for human health and the environment were the impetus for the enactment of the major federal legislation - the Resource Conservation and Recovery Act of 1976.

***Concerns and Findings of Congress for Solid Waste Disposal During Late 1970s***

During the crafting of the RCRA, Congress knew that it had the opportunity both to regulate disposal methods and to reduce the generation of waste by regulating production and products. Several bills were introduced to minimize waste by regulating product contents, consumer product packaging and manufacturing processes; however, these bills did not pass. Congress gave substantial power to states for solid waste policy making and implementation since many bills, which would reduce the role of states, failed to pass.

Congress highlighted important findings about land-based solid waste disposal when the RCRA was amended in 1984. The new federal legislation was based on the following findings: (1) New methods of manufacturing, product packaging, and marketing were increasing the amount and changing the characteristics of solid wastes. (2) Economic and population growth, together with a rising standard of living, was increasing industrial production and the need for new construction, resulting in increases of scrap material. (3) The concentration of populations was creating financial, managerial, intergovernmental and technical problems in the disposal of solid waste. (4) While the collection and disposal of solid waste is especially a function of the states and localities, the problems identified have

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become national in scope requiring federal assistance (RCRA of 1976, U.S. Code 1988, Title 42, section 6901).

The Congress found, with respect to the environment and health, that: (1) Most solid waste is disposed of in sanitary landfills or open dumps. (2) Disposal of solid waste in the ground can be harmful to human health and the environment if not managed properly. (3) The Clean Air Act and Water Pollution Control Act have created greater amounts of solid wastes that have not been properly disposed of in many cases and have ultimately led to greater amounts of air and water pollution. (4) Open dumping is harmful to health by contaminating drinking water supplies above and under ground. (5) Improper disposal of hazardous wastes could result in considerable harm to health and the environment. (6) Alternatives must be found for solid waste disposal because many cities are running out of suitable disposal sites (RCRA of 1976, US Code 1988, Title 42, section 6901).

Congress also found, with respect to materials and energy that: (1) Millions of tons of recoverable materials are unnecessarily buried each year. (2) Methods are available to separate solid waste from usable material. (3) Recovery and conservation of such materials can reduce United States dependency on foreign sources. (4) Solid waste represents a potential source of fuel. (5) Alternate energy sources can reduce our dependence on fossil fuels, nuclear, and hydroelectric energy. (6) Technology exists to produce usable energy from solid waste (RCRA of 1976, US Code 1988, Title 42, sec 6901).

With these findings, the act proposed to assist in developing and encouraging environmentally sound methods for the disposal of solid waste. It also proposed to maximize the utilization of valuable resources including energy and materials, and to encourage

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resource conservation. These objectives were to be accomplished through federal technical assistance to states or regional authorities for comprehensive planning pursuant to federal guidelines designed to foster cooperation among federal, state, local governments, and private industry (RCRA of 1976, US Code 1988, Title 42, sec 6902).

### *Goals and Expectations of the RCRA*

According to Wilt and Davis (1996), the main focus of the RCRA is the resource and energy lost in the disposal of garbage and the need to upgrade open dumps to sanitary landfills. The second main objective of the RCRA's landfill provision is to protect human health and the environment. To achieve the second goal, a landfill management plan must include steps to properly monitor the landfill while it is operating and must maintain the facility for at least 30 years after it is closed. Landfill owners also must show that they have the means to finance closure and post-closure care of the landfill as well as the cleanup of any leaks.

One of the goals of the RCRA's prohibition on open dumps is to raise the cost of landfills to a point where resource recovery and recycling activities could be competitive. Since 1976, Congress intended USEPA to vigorously regulate land disposal for the goal described above. However, between 1976 and 1984, USEPA did little to increase the cost of land disposal. Therefore, in 1984, Congress, mistrusting of USEPA's ability to regulate land disposal to protect health and the environment, amended the RCRA to prohibit many wastes from being disposed of land unless USEPA established that such disposal did not present harm to human health and the environment (Kovacs 1986, 24). These new amendments facilitated landfill closures and promoted nationwide recycling practices as expected.

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The third important goal of the RCRA is to require each federal procuring agency with respect to any procurement in excess of $10,000, to procure items composed of the highest percentage of recovered materials practicable. USEPA is required to provide each federal agency with information on the availability, sources of supply, and potential uses of materials recovered from solid waste. Each procuring agency is then required to procure materials composed of the highest percentage of recovered materials practicable. It should be noted that the definition of recovered material only includes materials recovered from solid waste and does not include energy recovered from solid waste.

***Implementation of the RCRA and Responsibilities of States***

As the principal national law regulating the management of solid waste, the RCRA is designed to encourage communities to manage solid and hazardous wastes in an environmentally sound manner that maximizes the use of valuable resources, including energy and materials recoverable from solid waste. Under Subtitle D of the RCRA, the federal government is responsible for setting criteria and minimum technical requirements for environmentally sound disposal facilities, while states are responsible for enforcement (Starkey and Hill 1996, 4-5). By design, the RCRA does not provide for a comprehensive federal regulatory role in municipal solid waste management. Therefore, states have passed regulations for landfills and incinerators and have set recycling goals. Federal government may play important roles in solid waste management, including recycling requirements, incinerator restrictions, flow control, stopping subsidies for virgin materials, procurement policies, and a national bottle bill (Murphy 1993, 6-7).

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There was no guidance at the federal level for the workability of technology or technical assistance in the planning aspects of solid waste management. The only federal incentive in the planning aspects of solid waste planning is the issuance of industrial development bonds. Federal government has little incentive and willingness to get back into the solid waste business (Kovacs 1986, 22); therefore, states and industry manage solid waste problems under federal provision and regulations. States do not directly manage solid waste collection. However, few states like Delaware involve directly in solid waste disposal by having regional landfills. Local governments and the private sector achieve the actual solid waste collection and disposal.

Kovacs (1986, 19) described USEPA's implementation of the RCRA as fragmented and inconsistent. Similarly, regarding nonhazardous solid waste regulation of the RCRA, Goldsteen (1993, 181) postulated that enforcement authority is generally not strong and "legislation limits the federal role to establishing minimum criteria for the best practical controls and the monitoring requirements for solid waste disposal facilities." USEPA has separately managed the Subtitle C hazardous waste program of the RCRA as if it is not related to the Subtitle D solid waste program (Kovacs 1986). When Congress enacted the RCRA in 1976, it established separate authorities for Subtitle D Solid Waste Management Planning Programs and the Subtitle C Hazardous Waste Management Programs.

In the Subtitle D programs, each subsequent year's authorization for the program was diminished because Congress considered solid waste management as a state and local function. The federal role was to give the states the seed money for solid waste planning and a time period to establish their own mechanism to implement an approved solid waste plan.

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From the date of enactment of the RCRA, state and local governments realized that they were responsible for implementing their solid waste plans and to generate their own funding. In the Fiscal Year 1983 budget, there were zero federal funds appropriated for solid waste management.

Without occasional USEPA review, the state planning authorities were free to implement whatever projects they wished. States are left to their own discretion as to the implementation of their solid waste plans. Such a lack of discretion from the federal government provided states with freedom to develop their own solid waste management practices. Therefore, each state can utilize a different approach to solid waste planning, or a combination of approaches. Freedom of states to develop solid waste plans has resulted in innovative and experimental solid waste practices. For example, the state of New Jersey, to preserve landfill space before getting its waste to energy facilities on line, established a recycling allowance in which local municipalities receive a rate from the state based upon the amount of materials recovered. New Jersey policymakers believed that their remaining landfill capacity could be economically extended (Kovacs 1986, 22).

Some states, like Pennsylvania and New York, have stricter regulations as compared to the requirements of the RCRA. In states requiring major revisions in their regulations, the changes may affect future costs for building, operating, and maintaining landfills. As with incineration, state officials and landfill owners and operators must keep one step ahead of regulators' definition of "state-of-the-art" and anticipate future requirements.

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## Trends in Municipal Solid Waste Generation and Disposal

Analyzing solid waste disposal requires an accurate understanding of solid waste generation. Such information also is necessary for devising and evaluating effective policy strategies. A few of the most dominant trends are highlighted below.

### Factors Affecting Solid Waste Generation and Discards

The amount of waste generated and the specific components of the waste itself vary tremendously because of factors such as geography, seasonality, and demographics. Waste generation rates can range from a low of half a ton to a greater than one ton per person per year, depending on the mix of properties - residential, commercial, industrial and institutional. The USEPA report (1992) distinguished between generation and discards. Generation (called gross discards in earlier USEPA reports) refers to the quantities (weights) of materials as they enter the waste stream. Discards refer to the municipal solid waste remaining after materials have been recovered for recycling or composting. The materials in the discard category are presumably landfilled or incinerated. The USEPA does not have an estimate for these other disposal practices, but the amounts are believed to be small.

### Future Trends in Municipal Solid Waste Generation

After the year 2000, per capita waste generation is expected to decrease. The generation of yard trimmings also are expected to plateau, while increases in per capita generation of products and packaging may continue, causing total municipal solid waste per capita generation rates to rise to 4.8 pounds per person per day by 2010. Achieving a decline in projected overall and per capita waste generation requires continued emphasis on source

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reduction activities, which prevent waste before it is generated. For example, state and local efforts to keep yard trimmings out of landfills are projected to result in a 25 % decrease in yard trimmings generation by the year 2000 from the 1994 estimate of 30.6 million tons. (USEPA 1996, 3). While the percentage of municipal solid waste being disposed of in landfills is decreasing, the actual tonnage is expected to increase to the year 2000. Landfilling is expected to be the predominant municipal solid waste management method in future years.

USEPA (1992) estimated municipal solid waste generation rate in the United States as 2.0 kilograms per person per day (4.4 pounds per person per day) for 1990. Residential waste accounts for 55 % to 65 % of the total MSW generation, while commercial waste ranges between 35 % and 45 % of municipal solid waste. For 1990, the daily per capita discarded quantity estimated to be 1.6 kilograms (3.6 pounds), reflecting a 20 % diversion rate. The generation of municipal solid waste increased by 2.8 % per year between 1980 and 1990. The increases in the quantities of paper, plastics, wood, and nonferrous metal are particularly noteworthy. The increase in generation is generally attributed to both an increase in the population and an increase in the per capita generation rate (Rhyner et al. 1995, 28-29).

## Historical Trends and Results of Land-Based Solid Waste Disposal Practices

### Trust on Technology and Development of Sanitary Landfills

The sanitary method of landfilling was first developed in England during and immediately following World War I. In practice, many sanitary landfills were similar to open dumping. Land-based solid waste disposal seemed advantageous during the 1940s and 1950s because of the relatively low cost of landfilling waste at those times in most part of the

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United States. There was easily accessible cheap land, which can be converted to a landfill with little initial cost at the outskirts of the growing cities and suburbs. Landfills had been established with little precaution and design requirement in the abundant undeveloped land at the outskirts was thought to handle any amount of garbage generated in the cities until 1960s (Blumberg and Gottlieb 1989, 16).

It has been suggested that earlier sanitary landfills in the United States were neither sanitary neither in original conception nor in final management. The first sanitary landfills in the United States were established in New York City and in Fresno, California in the 1930s. By 1940, the Army had begun research and experimentation in this area. Five years later, nearly 100 municipalities had either developed or initiated plans for a sanitary landfill.

Surveys during the 1950s by the American Public Works Association and the United States Health Service indicated that less than 50 % of the United States residents living in cities were living in communities with approved sanitary and nuisance-free methods refuse disposal (American Public Works Association 1961, v). During 1950s and 1960s, sanitary landfilling was seen as a method based on the principles of engineering capable of eliminating any hazards to public health or safety as opposed to simply burying the wastes without any additional intervention. The goal of sanitary landfilling was to minimize the health concerns associated with open dumping used worldwide as a waste management method for centuries (Blumberg and Gottlieb 1989, 16-17). However, sanitary landfills are not a final solution to solid waste disposal in spite of its relative safety.

During 1960s and early 1970s, the emphasis on technology enormously strengthened the position of sanitary landfills over open dumps. By focusing on the health and

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environmental impacts of both open dumps and earlier sanitary landfills. Congress enacted the RCRA of 1976. The RCRA, its amendments, and related USEPA regulations arranged the rules for construction and operation of solid waste landfills to eliminate open dumps and reduce pollution. Since then, landfill requirements have become more stringent.

The sanitary landfills were thought environmentally benign and safe for public health. They were seen as a real alternative to open dump. Yet the sanitary landfill never really had a chance to establish itself as an alternative to open dumps. By the late 1970s and early 1980s, the focus on landfill problems extended to all sites, including those that met the new and more stringent standards, such as clay caps and liners to prevent leaching of the wastes into the groundwater.

As many as 14,000 communities were using open dumps in 1972, according to USEPA. A few years later, another USEPA study estimated that there were 17,000 to 18,000 existing landfill sites; more than 90 % of them failed to meet even the minimum requirements for a sanitary landfill (USEPA 1971). With the new legislation in 1976, an increasing scarcity of urban landfill sites, and growing public concern about contamination of the land and water finally led to real pressure on the open dump system.

Many sanitary engineers and public works administrators in local governments saw sanitary landfills as an inexpensive and reasonable way for the permanent storage of solid wastes for more than three decades. Policymakers encouraged the use of sanitary landfills since they controlled the spread of disease from birds, vermin, and protected the air from chemical and biological releases. Modern landfills have considerably decreased pollution problems associated with previous open dumps (Starkey and Hill 1996, 16).

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A sanitary landfill begins as a hole dug in the ground with a layer of compacted soil and a synthetic liner, or both. Garbage is dumped and covered with a layer of soil, foam, or plastic at the end of each day. New landfills are designed to reduce the potential risks of groundwater contamination and methane emissions. To provide better pollution control, all new and expanded landfills are required to be constructed with a liner, a leachate collection system, a landfill gas control system, and a groundwater monitoring system. Once a landfill is full, the owner/operator must carry out the landfill's closure plan previously submitted to the state. Subtitle D requires that: (1) Closure plans must include activities to properly close the landfill and monitor and care for it for at least 30 years after closure. (2) Closure plans must include covering the landfill with soil (Murphy 1993, 95-96). It also requires that sites must remain open to inspectors; and odors, vermin, and birds must be controlled at all times including the next 30 years after closure. In addition, newer landfills are required to be double-lined, piped, vented, leachate tested, and eventually covered.

## Federal and State Regulations Increase Privatization of Solid Waste Disposal

Because of stricter landfill regulations, thousands of landfills were closed within a decade. The solution seemed to be fewer but larger landfills; in relative terms, giant dumps are cheaper to build than small ones. Wilt and Davis (1996) claim that strict rules about landfill safety have created good business opportunities for multi-million dollar waste companies instead of relieving environmental pressures. Multi-million dollar waste companies offer desperate communities large landfills in exchange for some money. The private sector entered into municipal solid waste collection and street sweeping business with

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municipalities in the late nineteenth century. Private sector investments in solid waste disposal and recycling are more recent. Municipal solid waste disposal became a profitable and attractive business in the 1980s for private companies when the RCRA and its amendments became effective.

> The 1978 Supreme Court defined garbage as an object of commerce. Since then, "the legal climate affecting solid waste management has become more constrained, leaving local governments and states with less guarantee of how much waste, where and how it will be disposed. ... Pressures from solid waste management industry, court decisions about flow control and aggressive legal campaigns opened the door so widely for the privatization of waste management so that there is little reasons and ways left for state and local governments to insert themselves into the marketplace to implement important policy objectives. (Wilt and Davis 1996)

Flow control provisions allow state or local governments to designate where municipal solid waste is taken for processing, treatment, or disposal. Flow control ordinances became popular in the late 1970s and were authorized by nearly 40 states. State and local governments implemented flow control as a mean to support the development of solid waste management infrastructure (Starkey and Hill 1996, 2-3; Wilt and Davis 1996). Development of facilities requiring large capital investment such as material recovery facilities, often were the benefactors of flow control ordinances. In this manner, long-term waste receipts were guaranteed to generate enough revenue to pay facility debt service and related costs (Wilt and Davis 1996).

Some local communities, especially those hard-pressed financially, long ago signed private contracts for waste disposal. The number of private waste disposals companies and their investments have been increasing. For example, in 1993, a private waste company, Waste Management (WMX), invested more than 3.6 billion in landfills. As of 1994, publicly owned land disposal facilities accounted for about 86 % of those operating in the United

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States, and the commercial waste management industry owned about 50 % of the available landfill capacity (General Accounting Office 1995). A switch from public to private services to take advantage of lower initial costs or to receive a large initial payment may not necessarily be cost beneficial in the long term. Loss of control on long-term costs and potential loss of the future use of the facility by the jurisdiction are perhaps the greatest disadvantages of turning public facilities over to the private sector (Belue et al. 1997).

Private waste disposal companies are looking for places where opposition is weaker. Rasmussen (1992, 130) noted their general operation rule: The fewer the neighbors, the fewer the intense NIMBY opponents and the more easily political entrepreneurs can sponsor a project. Waste disposal facilities are more easily sited in the middle of open fields than in heavily populated areas since benefits are fixed whenever a disposal facility is located. Thus the smaller the population, the more this benefit is worth per capita. Despite these problems of privatization, Starkey and Hill (1996, 29) claim that privatization and public – private partnerships are beneficial because of economies of scale, easy financing.

## Federal and State Regulations Increase Regionalization of Solid Waste Disposal

Due to the closure of many landfills, regional disposal facilities have been gaining importance. More than 40 states have actively promoted regional solid waste management through legislation. In general, this legislation has been developed where counties have historically been active in providing local governmental services. In general, the regional organizations outside the Northeast have failed to carry out their plans because of inadequate financing mechanisms. However, in the face of rapidly diminishing landfill capacity,

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regionalization helps to keep regional capacity long enough and tipping fees reasonably low (Tennes 1995, Waters 1993).

Regional facility development in the Northeast was inspired from perceived and actual need for alternative disposal options. Consequently, local governments were willing to use a variety of financing mechanisms to answer increased demands. In contrast, regionalization efforts in much of the rest of the country have focused on planning efforts for compliance with the RCRA Subtitle D standards and other requirements (Craggs 1995).

In various regions of the United States, regionalization as the collective management of waste services by more than one municipality, has evolved to represent a variety of approaches. These approaches include partnerships between a county and the cities within its jurisdiction, a collective venture of several cities, or a group composed of county governments. Regionalization is believed to provide direct and indirect benefits to local governments. The primary benefits include economies of scale, shared liability, minimization of siting and permitting constraints and shared resources (Craggs 1995; Starkey and Hill 1996).

Many states now require some form of solid waste planning. These plans include the characterization of the existing management system and identification of alternative approaches to promote long-term viability. Indiana, Missouri, and Ohio created regional solid waste districts responsible from planning and disposal with special legislation. California created special service districts that are limited-purpose governmental units responsible for sanitary services including solid waste disposal (Craggs 1995). Regionalization of solid waste disposal is seen as helpful to achieve economies of scale, increase efficiencies in

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service delivery and spread fixed costs (Belue et al. 1997). The cost-sensitive nature of most waste management facilities may continue to create pressure for fewer but larger regional facilities (Williams 1994, 2.4).

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# CHAPTER III

# ISSUES OF LAND-BASED SOLID WASTE DISPOSAL

## Introduction to Issues of Land-Based Solid Waste Disposal

Two types of issues are related to land-based solid waste disposal. The first group can be referred to *negative environmental and health effects of landfills*. Groundwater and surface water contamination, methane gases emissions, releases of toxic materials, and other health threatening material, noise, and traffic congestion are in this first group. The second group of concern to land-based solid waste disposal is related to *management of land for competing unwanted uses* including siting landfills. Management related concerns are siting issues, higher cost, remaining years of landfill capacity, and uneven distribution of landfills.

Currently, the most prevalent method of disposing of solid wastes is to first collect them from the source and then bury them in a landfill. Landfills have always managed a significant portion of the municipal solid waste stream, although their use fluctuates with changes in the use of alternative waste management methods. In 1990, approximately 67 % of municipal solid waste in this country were buried. Landfills are inevitable even in communities where alternative disposal methods are promoted to the highest possible extent. The use of alternative methods tends to increase when landfill costs increase, when landfill capacity decreases, or when serious environmental and health problems of landfills happen.



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## Health and Environmental Issues of Landfilling

Environmental and health concerns surrounding landfills persist, despite substantial improvements are achieved in landfill design and technology. Modern landfills are designed to entomb garbage and keep pollutants away from the environment, thus prolonging the decomposition process. Releases of potentially toxic substances from landfills still can negatively impact water sources and the atmosphere. Groundwater and surface water can be contaminated by leachate (a liquid generated from rain, snow, and decomposing trash that passes through a landfill, picking up contaminants along the way). Without proper pollution control equipment, potentially toxic gases and methane can be released into the air.

### Groundwater Contamination

Historically, landfills have been associated with some significant problems, including groundwater contamination, which partly explains the public's resistance to new facilities. Nearly half the country's population draws its drinking water from aquifers and other groundwater bodies. Groundwater also is used extensively for agricultural, industrial, and recreational purposes. Landfills may increase contamination of this valuable resource if they are not designed to prevent waste releases into groundwater or detect them when they occur. Groundwater contamination problem from waste disposal sites (industrial, household, and hazardous) have yet to be solved despite better technological applications and stricter rules in managing the sites.

Leachate can contain a broad range of chemicals, including metals such as lead, cadmium, and mercury, and organic chemicals such as benzene. Precipitation levels, site topography, facility design and operation, and the type of final vegetative cover influence the

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amount of leachate generated by a landfill. To lower environmental and health risks posed by leachate, landfills that receive waste after October 9, 1993 are required to install a groundwater monitoring system and set aside money to pay for groundwater cleanup. Of the estimated 5,800 operating landfills in 1993, fewer than 1,500 of them had groundwater monitoring systems and only about 900 had liners.

A groundwater monitoring system consists of a series of wells located near the landfill. The presence and migration of contamination can be detected so that pollution of groundwater sources can be prevented. Managing leachate to protect the groundwater is one of the most important issues communities must address in the design, operation, and long-term care of landfills. Leaching is a problem facing almost all landfills. USEPA documented widespread contamination of both groundwater and surface water that had resulted from the inadequate design, location, or operation of municipal landfills. USEPA's survey in 1986 documented these negative trends (USEPA 1986):

(1) Nationally, only about 25 % of existing municipal solid waste landfills had the capability to monitor groundwater; of these 36 % had documented deficiencies in their groundwater monitoring programs.

(2) Despite data gathering deficiencies, at least one-quarter of those municipal solid waste landfills monitoring their groundwater were known to be contaminating groundwater.

(3) A separate USEPA-sponsored study of 163 landfill case studies chosen to be nationally representative found groundwater contamination or adverse trends in groundwater quality at 146 sites (Federal Register 1988, 33366).

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(4) Less than 12 % of existing municipal solid waste landfills monitored for surface water contamination; of these, however, 60 % were contaminating surface waters.

(5) Only one out of every six existing municipal solid waste landfills was lined, and only one out of 20 had a leachate collection system.

(6) Only about one-third of the states had regulations specifying liners, which could be natural or synthetic, for new municipal solid waste landfills, and less than two-thirds specified any leachate controls.

Cleaning up contaminated ground water is a long and costly process, and in some cases, may not be totally successful. Affected communities often bear both the cleanup costs and the expense of prevention. Rising public resistance to siting new landfills compounds the problem of managing the increased volume of municipal solid waste. The regulations are designed to ensure that new or expanded landfills do not contaminate ground water and thus become community burdens.

## Methane and Other Gases Emissions From the Landfills

Approximately 60 to 110 pounds of methane gases per ton of wet municipal solid waste are formed in the landfill during the first 20 years. About 9 to 16 pounds of those gases are not recovered. Collection system limitations and the permeability of covers leaked the gases into the atmosphere. USEPA estimates that 12 million tons per year of methane are released from landfills of the United States (Federal Register 1991, 24468-24528).

Environmental releases from landfills consist of uncaptured emissions of trace amounts of a variety of hazardous gases, as well as larger quantities of methane and of carbon dioxide, which are generated in the landfill in volumes approximately equal to that for

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methane. Methane is both toxic and explosive. Other volatile, carcinogenic compounds, such as benzene, chloroform, and carbon tetrachloride also are released from landfills. These emissions occur both through leakage and through separation from the captured landfill gases. In addition, USEPA estimates that present landfills release 283,000 tons per year of nonmethane organic compounds or about 1 % of stationary source emissions in the United States (Federal Register 1991, 24468-24528).

In 1991, approximately 157 landfills in the United States operated or planned to operate landfill-gas-to-energy facilities. Two-thirds of them have used the recovered gases to produce electricity. Only 157 of the nation's approximately 6,000 operating landfills as of 1990 were operating or plan to operate landfill gas-to-energy plants. The largest landfills (about 200 with a capacity of more than 1,000 tons per day) are more likely to include the energy recovery facilities, and those landfills receive more than 40 % of all municipal solid waste landfilled in the United States. In comparison with facilities that either collect landfill gas and flare it or allow the gases to escape into the atmosphere, landfill gas-to-energy operations reduce the environmental releases of methane while providing an energy benefit (SRI International 1992, 97).

When landfill gases are released to the air or accumulated in higher amounts and exploded, it is considered as environmentally unwanted. Landfill gases become environmentally safe and desirable when they are collected and processed. Landfills and incinerators produce methane, which is an energy source similar to natural gas, but with about one-half the heating value. Landfill gas is recovered for energy in little more than 100 of the nation's larger landfills and 17 % of it is burned, most of it with energy recovery. Collection and processing

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of methane gases are more economically feasible in newer and larger landfills. In 1992, more than 100 facilities had recovered methane. The number of landfills collecting or actively planning to recover landfill gas have increased approximately to 200 in the second half of the 1990s (Starkey and Hill 1996, 17).

An optimal collection system working under ideal conditions can recover up to 80 % of the methane produced by a landfill. Recovered methane can either be used as a low-grade fuel or upgraded to pipeline-quality methane. If a market does not exist, the gas can be used at the landfill in boilers, furnaces, or electric generators. Recent USEPA source performance and emission guidelines require the collection of methane from large landfills - those with 2.5 million metric tons design capacity - with emissions of greater than 50 megagrams per year. Starkey and Hill (1996, 17) claim that "the amount of revenue received from the energy (methane) collected and used, however, may not outweigh the costs associated with building and operating a methane energy collection and storage facility. Therefore, most landfill operators manage methane by flaring it."

## Managerial Issues of Landfilling

### Landfill Closures and Remaining Years of Landfill Capacity

Thirty-seven states have more than 10 years of capacity left. In the Northeast, 5 states out of 9 have less than 10 years of remaining capacity. In the West, 11 of the 11 states have more than 10 years of remaining capacity. It is expected that where landfill capacity is adequate (more than 10 years) the landfilling rate may not be lower. Some states in the West coast (Washington and Oregon) seem to be exceptions to this assumption because they have

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relatively low landfilling rate despite more than 10 years of remaining capacity. Environmentalist culture, interest group pressures, and proximity to Asian recycling markets can explain this.

Methods and rates of disposing municipal solid wastes may radically change from one state to the next. Reasons for these differences are partially explained by variances in available local landfill capacity and the local cost of landfilling. Remaining years of capacity is associated with landfill closures due to regulations or other factors, siting issues and increasing total volume of garbage generated. When more garbage is generated, existing landfill capacity is consumed faster.

Communities where a capacity crisis is a serious issue are not rare. Seventy-five percent of current landfill capacity will close within 10 to 15 years. Some will close because they are full, but others will close because they are poorly located, poorly designed, or poorly operated and thus pose environmental problems. These capacity problems are strongly driven by two factors: the failure to site new capacity and the unwillingness of communities to accept waste from other communities, particularly those that are distant.

The number of landfills had decreased from more than 20,000 in the early 1970s to less than 4,000 in 1996. The accuracy of this number is not known because few records were maintained by states [1]. However, it was probably an overestimate. In 1986, USEPA attempted to quantify the number of municipal solid waste landfills in the United States to support its Subtitle D rulemaking efforts. At that time, USEPA estimated that some 6,034 active municipal solid waste landfills existed, and that landfill numbers were expected to decline by more than 2,000 by 1992 (Repa and Blakey 1996).

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In 1996, New York City Mayor Rudolph Giuliani and New York Governor George Pataki announced an agreement to close the city's last landfill, the Fresh Kills Landfill. Without additional landfill space in New York, an additional four million annual tons of municipal solid waste will be added to the interstate waste market after Fresh Kills closes on December 31, 2001 (Shapard 1997).

Not everybody supports the idea that there is a landfill capacity problem and landfilling should be avoided. For example, Arnold (1995, 213) wrote, "recent evidence suggests that landfill space is far from scarce. Indeed, much of the nation now possesses considerable excess solid waste disposal capacity, enough to last for many decades in many cases." It is true that some states have larger capacity despite fewer landfills. Very large regional landfills built by the private sector have increased remaining landfill capacity in some states. Despite relatively larger capacity in some parts of the country, states with severe landfill crisis continue to promote alternative disposal methods and distrust on landfilling. Contrary to general belief, Kharbanda and Stallworthy (1990, 56) pointed out that "if the proper procedures are used, it is not only possible to dispose of wastes quite safely by landfill, but the environment can be protected as well."

Americans are generating more municipal solid wastes each year. In 1990, Americans generated more than 195 million tons of municipal solid waste, and the annual amount is expected to be more than 220 million tons by 2000 and 262 million tons in 2010, according to USEPA. Natural population growth and sustained long-term growth in the economy account for this projected increase. Per capita generation rates are projected to remain constant at a 4.4 pounds per person per day to the year 2000. Projected decreases in per

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capita generation and yard trimmings during this time will be offset by increases in per capita generation associated with the discard of products and packaging (USEPA 1996, 1-3).

Under the 1984 amendment of Subtitle D of the Resource Conservation and Recovery Act of 1976, stricter federal pollution controls have been established for landfills. Because of stricter state and federal landfill regulations concerning methane gas generation and ground-water contamination, thousands of landfills have closed. Fifteen years ago in Pennsylvania, there were more than 1,000 active landfills; today, this number is less than 100. USEPA standards and Subtitle D of the RCRA have affected states' solid waste management.

In the last decade, the nation has experienced revolutionary changes in the management of municipal solid waste. Federal and state regulations concerning the land, air, and water gradually change and strengthen (Belue et al. 1997). Many land disposal facilities have been replaced by waste-to-energy plants, which increased their capacity to manage waste tenfold during the 1980s, and now manage 15 % of the nation's municipal solid waste. But the growth of waste-to-energy has now stalled due to increased costs and environmental concerns (Blumberg and Gottlieb 1989). In the last 5 years, recycling and composting have been the fastest growing methods of waste management, accounting for nearly 24 % of waste management in 1994, up from 10 % in 1986. In response to declining landfill capacity, the number of operating resource recovery plants also has increased from 25 in 1980 to 160 in 1989. The traditional method of disposing of garbage in landfills is declining.

Solid waste issues have been a major public concern over the last few decades. Since 1984, two-thirds of the nation's municipal landfills have closed; the burning of municipal solid waste to generate steam or electricity has increased six-fold; and more than 7,000 local

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governments have begun to curbside collection of recyclable materials. State and local governments play the lead role in solid waste management. They decide how waste will be managed - whether by landfill, incineration, recycling, compost, or some combination - and set standards for the resulting facilities under the range and guidelines of USEPA regulations and the RCRA Subtitle D. In addition to dwindling capacity, the cost to dump or incinerate is increasing.

## Economic Considerations and Increasing Landfill Costs

The worst general shortage of landfill space is in the Northeast, with the large cities of the northern Midwest close behind. As public and private landfill operators in these regions have recognized the true value of their remaining landfill capacity, tipping fees have risen dramatically. In New Jersey, for example, typical tipping fees escalated from $30 to $125 per ton between 1983 and 1987; a tipping fee is the charge levied for unloading solid waste at a landfill, incinerator, or transfer station (New York Times 1988). Not only tipping fees have increased in recent decades, but also total cost of solid waste disposal has risen dramatically.

In 1980, the annual cost of collection and disposal exceeded $4 billion. Among the various expenditures for public services, this amount was surpassed only by the costs for schools and for roads at the local government level. In the early 1960s, local governments spent approximately $1 billion; in 1940 the figure was only $300 million (Melosi 1981, 194).

Due to capacity shortages and strengthened environmental regulations, the cost of municipal waste management continues to increase dramatically in most areas of the country. This has caused a crisis for many communities. The average national price for landfills has

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dramatically increased from $10 per ton in 1983 to around $35 per ton in 1992. In the Northeast, the prices can be more than $125 per ton. In South Dakota, the landfill tipping fee is less than $10. (SRI International 1992, 98). On top of these prices the new federal and state solid waste landfill controls may cost between $12 and $17 per ton on average. The variation between individual landfills is large, and the incremental cost of new controls can range from as low as $1 per ton at an extremely well-located landfill to more than $41 per ton, according to USEPA in its Regulatory Impact Analysis performed to support the proposed Subtitle D rule, December 1988. These figures are strictly for the incremental cost of implementing the new federal solid waste landfill regulations. As such, these costs vary in many parts of the country. The lack of capacity continues to drive prices even higher because value for remaining capacity is based on the cost to create new capacity. As long as the siting process remains in a bottleneck, the value of remaining capacity continues to increase (Williams 1994, 2.3). According to a report prepared by SRI International (1992, 98) "the higher costs in some states result from the scarcity of suitable landfill sites, dense population concentrations in metropolitan areas, tighter state environmental regulations, fees, and higher transportation and labor costs."

The increasing cost of land-based solid waste disposal can be explained by the two-way relationship (as mentioned in chapter 2) between solid waste practices and federal and state regulations. The spiraling costs of landfilling, as well as the complexities of siting new landfills are the key legislative intents of the RCRA and Congress. One of the primary goals of the RCRA is to drive up the costs of landfilling so as to reflect its true economic costs to society, as well as to support newer technologies for the treatment, storage, and disposal of

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solid waste. Therefore, one of two focuses of solid waste disposal is who pays for the cost of improper garbage disposal. The second focus is whether USEPA and Congress have the courage to impose the true costs of land disposal on the owners and operators of landfills so as to make the new waste treatment, storage, and disposal technologies more competitive (Kovacs 1986, 23).

All the above trends are supported by other studies related to recycling and solid waste management. For example, McClain (1995) pointed out that there are political, social and economic factors related to recycling and per capita solid waste generation and disposal. She found that tipping fees, disposal space and siting costs affect recycling, and recycling affects landfilling. To McClain, higher tipping fees make recycling more economically viable. The revenues from the sale of recyclable materials may be small or even negligible, as long as the net cost of operating the recycling program is less than the landfill tipping fees, and local officials promote recycling as an alternative to land-based solid waste disposal. Similarly to McClain, SRI International (1992, 98) stated that "cost variations from state to state and region to region can strongly influence the degree of desirability of choosing alternative strategies for MSW management." Closure of landfills with no replacement pressurizes state officials commit to more recycling and source reduction. The decline of capacity in a community, not the decline of the number of active landfills, pressure states and localities to use alternative disposal methods.

## Uneven Distribution of Landfill Capacity

Subtitle D of the RCRA directed the USEPA to set federal standards for the management of industrial and municipal non-hazardous solid waste in sanitary landfills. Under the

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amended Subtitle D of the RCRA, stricter federal pollution controls have been established for landfills. These include restriction on the location of landfills and prescription for landfill liners, leachate (water that goes through waste) collection systems, methane gas monitoring, groundwater monitoring, closure, post-closure care and financial assurances.

There are many examples of regional solid waste problems and unbalanced distribution of landfills. For example, in 1986, 250 of Texas' 254 counties had at least one landfill; in 1995 only 130 counties had at least one landfill. A similar problem happened in Tennessee, New York, and other states. Stricter landfill regulations to protect the environment and human health are forcing local communities either to ante-up with new dollars for redesigning their current landfills, or close them (Texas Center for Policy Studies 1995).

Landfill closures, like those in Texas, create potential problems all around the United States. Among these are the increasing cost of disposal due to the long-distance transportation of waste, building and operating waste transfer stations, and illegal -potentially harmful- dumping. Moreover, transfer sites themselves may pose the same problems as to landfills: groundwater pollution, siting problems, vectors and odor.

Uneven distribution of landfills or landfill capacity does not occur only within state but also among the states. In general, more urbanized areas and the Northeast face the most severe landfill capacity problems. Repa and Blakey (1996) shows that the Northeast has only 280 active landfills, while West and Southeast have more than 850 landfills each. Since urban and suburban land is expensive and public reaction is higher in urbanized areas possibly due to more organized and informed residents, interstate shipment of solid waste happens, in general, from more urbanized and prospective areas to poorer and less densely

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populated rural areas. The noise, odor, and other unpleasant characteristics of solid waste disposal facilities cause them to be located well away from the highly populated areas. Along with the increased operational costs associated with tighter environmental regulations on these facilities, landfill availability and other factors cause solid waste disposal facilities to be located in poorer distant rural areas (Arnold 1995, 213).

The more heavily populated regions of the country produce more solid waste per square mile. As a result of economic factors and landfill scarcity, these states have been shipping solid wastes out of their own jurisdictions and into landfills in states that for the moment have some capacity to receive it. Greater capacity remains in the underpriced and underregulated landfills of the industrial Midwest, the South, and the Rocky Mountain states. As tipping fees rise, however, garbage becomes fluid, flowing from high-cost disposal options toward cheaper ones. New Jersey, once a destination for Philadelphia's trash, started shipping more than half of its solid waste to other states. Solid waste from the Northeast is turning up in Arkansas, Alabama, and Virginia. Under one scheme, baled garbage from the Northeast would be shipped by rail to a huge proposed landfill in New Mexico, and under another, Paraguay would be the recipient (Schroeder 1989).

## Siting Issues: Public Reaction to Landfills is High

The problems caused by municipal solid waste landfills have become a source of public concern in recent years. As Starkey and Hill (1996, 5) stated "although states have the opportunity to site new disposal facilities, citizen's concerns about the environmental and health consequences of new facilities have kept many from being sited, especially in heavily populated areas." As Americans become more aware of the potential threat to health an

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environment from toxic substances, they also become more concerned about the generation and management of solid waste - sometimes to the point of refusing to allow new landfills near their homes. The resistance of citizen groups and neighbors to the selection of disposal sites is a factor that exacerbates the problem of solid waste disposal.

As people become more concerned about the environment, so they are more likely to oppose disposal facility siting within their jurisdictions. Opposition stemming from environmental concerns about air and water quality may be mitigated by state environmental regulations which require state-of-the-art disposal facilities with sophisticated environmental control equipment (Gomez-Ibanez, Meyer, and Luberoff 1992). Furthermore, people tend to support environmentally favorable solid waste management options such as source reduction and recycling programs, which are viewed as "pivotal strategies for slowing environmental degradation" (Ladd and Laska 1991, 304).

Siting and permitting time frames for landfills and combustion facilities range from 4 years to 10 years, if they occur at all. Even recycling and composting facilities typically take several years to site and permit. Public and private institutions responsible for managing solid wastes do not have the public's confidence because of past environmental problems like groundwater contamination caused by landfills. Both Canada and the United States have suffered from declining rates of public confidence in public and private institutions. While not-in-my-backyard (NIMBY) politics in certain respects contributes to that lack of trust in prevailing structures, it also illustrates the willingness of the general citizenry to become informed and actively involved on pertinent social issues.

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Some analysts of the NIMBY phenomenon contended that siting resistance stems from a public that badly misunderstands uncertainty. Only few state and local governments have established effective dispute resolution techniques, preemption techniques, or voluntary partnership programs (Williams 1994, 2.3). Different perceptions and effective dispute resolution may shorten the time spent to overcome public reaction. Not all analysts agree that fear and public view about land-based waste disposal stems from misunderstanding. Rabe views NIMBY differently. To Rabe (1994, 14), "rather than view NIMBY as a millstone around the neck of regulatory efficiency, it can be viewed as an opportunity to move toward a more open, effective environmental regulatory system in North America."

## Chapter Conclusion

Through the decade of the 1970s, various environmental and health issues of solid waste disposal, particularly contamination of the land through landfills, became a central issue that contributed to the growing solid waste dilemma. In addition to environmental problems, managerial problems associated with landfill closures and capacity issues made USEPA's Office of Solid Waste Management one of the largest parts of the mushrooming environmental bureaucracy of the 1970s. This Office is basically devoted to reviewing and dealing with the problems of land disposal sites (USEPA 1973).

During the 1970s, because of growing discontent and leachate problems around land-fills, a new terminology arose to signify the new hopes: "resource recovery". It evoked the old Progressive dream of capturing part of the waste stream in some new form. This included recycling concepts, or materials recovery and, most significantly, to many of the public officials and waste industry executives, energy recovery linked to the burning of waste. The

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latter, known as "waste-to-energy" or "refuse-to-energy" was little more than a variation of an old theme: Burn it instead of burying it (Blumberg and Gottlieb 1989, 21). With the addition of the source reduction concept, USEPA's disposal hierarchy looks like a modified version of this old Progressive dream although USEPA has never implied or expressed it.

Landfills that meet federal standards can lessen environmental risks. Subtitle D of the RCRA requires landfill owners and operators to monitor water sources and to maintain a leachate collection system and a final cover for a minimum of 30 years after the landfill closes. This long-term maintenance requirement is critical, since even the most well designed landfills may eventually fail due to the natural deterioration of liners, leachate collection systems, and final cover materials (Starkey and Hill 1990, 16-17).

Modern landfills are relatively safer. However, despite safer and newer technology, more than 20 % of the 1,200 cleanup sites on the Superfund National Priority List are landfills. Modern landfills are not environmentally benign, but technical improvements made in landfill design and operation, combined with today's stricter standards, have lessened their negative environmental impacts. Improvements in landfill design and technology have not made siting a landfill easier. Contrary to the general belief that siting landfills is getting more difficult, Murphy (1993, 94-95) claimed that newer and safer technology has helped to renew public confidence in this waste disposal option.

Siting a disposal facility, particularly a landfill, is an increasingly difficult challenge due to public reaction and distrust to technology. Moreover, the technical constraints and regulatory standards are big hurdles in themselves - and the political issues involved are

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particularly volatile. The siting of new landfills also is hampered by the poor environmental track record of older dumps.

Before a landfill is constructed, an environmentally appropriate and politically acceptable site must be selected. Federal regulations help to guide communities in this process by creating specific requirements to improve the siting, design, and operation of new landfills. The RCRA's Subtitle D restricts the siting of landfills in flood plains, wetlands, earthquake prone areas, near airports, or where the ground cannot support the weight of a landfill. State and local governments can influence the selection of a site by requiring building permits, regulating the landfill size, and enforcing zoning ordinances. Landfill design criteria also are outlined in the new regulations.

New federal legislation to protect the environment has increased the cost of building new landfills. Moreover siting landfills has become increasingly difficult because the public opposes having such a facility nearby. The sharp decline is the result of landfills either reaching their capacity, or closing because they do not meet state or federal landfill design and operation standards.

Many of the smaller local landfills have been closed; however, larger active private and public landfills provide enough capacity in most of the country, so that the country's overall landfill capacity is not declining. Transporting waste to larger regional facilities and uneven distribution of landfill capacity now are the major problem. The closure of landfills and opening new large regional landfills, however, raise questions. It may be easier to site and build a landfill in the open spaces of New Mexico than in crowded New Jersey, but that does not help communities in New Jersey or the Northeast faced with decreasing landfill

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capacity unless they are willing to pay high transportation costs. It does not address the fact that people who live in those open spaces do not want to be the dumping grounds for other people's garbage (Murphy 1993, 94).

Goldstein and Glenn (1997) claimed that the solid waste disposal crisis of the late 1980s and early 1990s has vanished based on the information gathered by yearly "State of the Garbage Survey" of 50 states. Their survey shows that most of the states report adequate landfill capacity; and the national average landfill tipping fees have actually declined. Survey also shows that growth in recycling and composting programs is leveling out. Another sign that the crisis has ended is the minimal number of solid waste management laws coming out of state houses across the country. Bills that have passed primarily target specific waste streams or make minor changes to existing laws. There is some focus on the development recycling market.

The intent of Subtitle D and 1991 guidelines is not only to protect the environment and ensure public health by closing unsafe landfills but also to encourage the public to utilize methods other than landfilling for the disposal of solid wastes. It is expected that disposal costs will increase because of closure of landfills due to Subtitle D and other stricter state regulations. If disposal costs go significantly higher, then recycling and source reduction is expected to increase, and landfilling to decrease (Kimball 1992, 9).

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[1] Several agencies and organizations, including NSWMA, USEPA and the federal General Accounting Office (GAO) have surveyed state regulatory agencies to determine the number of existing landfills. Data collected by NSWMA from 1988 to 1991 showed that landfill numbers ranged from a high of 7,575 in 1988 (using GAO data) to a low of 5,368 (using NSWMA data). Individual state data evidenced a wide variability between surveys that could not be attributed to normal year-to-year variances. For example ECON magazine reported in 1991 that California has 1,012 landfills, while NSWMA data reported only 344 for the same year. Some of the variability in the data can be attributed to landfill closures and openings. However, most the variability cannot be accounted for, and one can only speculate about the causes (Repa and Blakey 1996).

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# CHAPTER IV

# INTEGRATED THEORY OF COMPARATIVE STATE SOLID WASTE MANAGEMENT

This chapter starts with the discussion that states are strong governments in environmental policymaking and implementation. The second section of this chapter focuses on creating new theoretical constructs to analyze state environmental policy outputs or policies and finding appropriate variables for theoretical constructs. A short discussion of traditional versus emerging theoretical constructs also is provided. Importance of integrated theory is discussed in the final section of the chapter.

## States' Role in Managing Solid Wastes

### States Are Strong Environmental Policymakers

States governments are strong in environmental policymaking and implementation. In fact, some states are more aggressive and innovative than the federal government in particular issues. It is clear that states are strong in managing most of the environmental issues because federal government wanted it so and regulated accordingly. Some states are very active particularly in solid waste management not only because of federal government regulations but also because of pressures created by solid waste issues or interest groups. The impact of federal government in solid waste policymaking and implementation has continued at least through major regulations like the RCRA. Federal government sets general goals and



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guidelines, while individual states have a significant amount of discretion in policymaking and implementation.

One of the main reasons states have taken over leadership of environmental issues is the more stringent federal environmental regulation. Another main reason is limited federal grants. In 1979, federal grants for state environmental programs addressing air, water, and waste problems totaled $479 million; by 1989, the total had dropped to $303 million in constant dollars. Meanwhile, the scope, cost and stringency of state regulatory programs have skyrocketed. To keep up, many states have vastly increased their environmental budgets.

## States Are Strong Policy Makers in Solid Waste Management

The turning point in solid waste regulation was the 1976 Resource Conservation and Recovery Act (RCRA) and its 1980 and 1984 amendments. The RCRA created interest and pressure at all levels of governments. With the impact of the RCRA and other stringent federal and state regulations, states started to play a major role in solid waste management with an emphasis on contamination of water, preservation of landfill space and promotion of recycling efforts.

States are strong policy makers in solid waste management. There are several indicators and reasons. First of all, a majority of the oversight, implementation, funding, research, and planning of solid waste regulation (policies) take place at the state level. Second, several use the discretion afforded by solid waste statutes. Finally, states often have significant environmental and solid waste programs and responsibilities of their own, separate from those required by federal enabling legislation (Ringquist 1993b, 3). As mandated by the RCRA, states have considerable responsibility in the design of policy approaches to the

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management of waste. This new federal-state relationship is called "centrally directed sharing".

The implementation of federal environmental regulations, including solid waste, is generally given to the states. In the era of increasing and stringent environmental regulations, landfill closures, problems of incinerators, and declining federal grants, states and localities are forced to take responsibility for solid waste management with limited economic resources. During the 1980s, fiscal resources to manage new environmental responsibilities from federal government declined while responsibilities increased. At the beginning, most states, except few like Wisconsin, Rhode Island, Oregon and New Jersey, resisted to raise funds to solve solid and other waste issues Starting with mid the 1980s, most states have taken more responsibility and created new policies. In general, state environmental and solid waste commitment has increased greatly since the 1970s.

Decentralization of federal environmental programs and the amount of federal money given to states as environmental grants-in-aid have been declined instead of increased. Thus, state environmental management in the 1990s and coming decades largely will be governed by two considerations that are internal to the states themselves. The first concern is the level of state institutional capability. The second concern is the level of state commitment to environmental protection including solid waste. While federal and local influences cannot be disregarded, these within-state influences are very helpful in understanding what the states have done in the area of environmental management (Lester 1990, 72). Significant solid waste policy, funding, staffing, and commitment differences take place at the state level.

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States are leading the way in solid waste reduction and recycling. In fact, the plethora of state laws has led some polluters to seek help from the federal government to standardize (and weaken) the mishmash of rules they face. For example, merchandisers of so-called "biodegradable" or earth friendly products are so troubled by the assortment of rules emerging from state capitals that they are lobbying the Federal Trade Commission to set national guidelines for what the labels mean.

## Development of Alternative Theories for Comparative State Environmental Policies

The first systematic, empirical investigation into variations in state policy outputs is generally attributed to Dawson and Robinson (1963). Ten years later, Paul Sabatier (1977, 218) lamented the fact that most political scientists concerned with environmental policy-making focused their attention primarily on federal government. He argued that too few studies, at that time, had focused their attention on the administration of the environment at the state level.

Sabatier (1977, 223) expressed a desire that future comparative state studies explore the respective roles of socioeconomic and political variables in explaining interstate variation in different types (e.g., distributive and regulatory) of environmental policies. To Sabatier, sociopolitical factors like economic resources, political culture, technology, public opinion, and the actual conditions or perceived problems would be accounted for changes in state environmental policy outputs. Sabatier's desire was very legitimate and his vision of respective roles of socioeconomic and political variables was a real improvement for the field when

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policy analysts were divided to prove that either only political or only socioeconomic variables are more important, and that one determines other argument.

During the past twenty years, numerous political scientists have answered Sabatier's call for comparative research on state environmental politics and policy. The earliest research in this area was largely descriptive in nature and qualitative in approach. But, by the early 1980s, quantitative state environmental policy analyses were beginning to appear in published literature. Some of this early research focused on the politics of hazardous waste management in the American states (Lester 1994, 696).

Sabatier's desire and framework have generated several empirical studies of state environmental policies. For example, Lester et al. (1983) tested some assertion by Sabatier. Their research, published in *Western Political Quarterly*, was the turning point in comparative state environmental policy research from more descriptive to more investigative. Lester and his associates used state hazardous waste policy for the regulation of hazardous waste.

The most general and often the most provocative questions in the social sciences rarely lend themselves to rigorous analysis. One such problem in public policy analysis concerns the mutual interaction between political systems and their socioeconomic environments. While researches on the policy outputs of state and local governments have burgeoned, it has been limited by a unidirectional causal model, which cannot capture a dynamic world of system-environment transactions (Fowler and Lineberry 1975, 243). The central preoccupation of state policy literature has been an ongoing contest between political and socioeconomic variables as competing explanations of state policies. Most empirical studies deployed that the socioeconomic model has more explanatory power.

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In the late 1960s, political scientists and some economists recognized the potential effects of policy and politics as independent variables. Political variables are utilized as part of unidimensional causal model not multidimensional impact model in most studies. Fowler and Lineberry (1975) emphasized the impact analysis of policies; however, they were unable to bring a framework where causes and impacts of policies could be examined together. They offered rational economic man paradigm, in which policy analysts have no interest. They rejected the assumption that inputs cause outputs in any simple one-way fashion; and that they explicitly entertain the possibility of reciprocal causation.

Apart from discussion between input cause output and reciprocal causation, later on, many policy analysts emphasized the need for new models or theoretical constructs in explaining public policies. Elite theory, incremental theory, interest group theory are among the most popular constructs used in public policy analysis. Most of these theories were utilized to explain a policy of a single state organization not a comparative study of states. Social scientists have labored for decades trying to explain why some state governments adopt the policies and programs. State environmental programs have received comparatively little attention although comparative state policy analysis can be tracked back to the mid-1960s.

Fowler and Lineberry (1975, 244-48) examined three paradigms that explain the relationships between outputs of a system and the composition of its socioeconomic environment. The socioeconomic determinism theory picked up their assumption as a possible causal theory. The socioeconomic determinism paradigm assumes that variations in socioeconomic

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attributes cause variations in policy outputs. This paradigm started to be used in the early 1960s and represented the conventional wisdom of policy analysis.

For much of the 1960s and 1970s, state political research was dominated by a concern with the comparative impact of politics and economics on public policies in the states (Brace and Jewett 1995, 657). Thomas R. Dye's 1966 study *Politics, Economics, and the Public: Policy Outcomes in the American States* was the pathbreaking example of state policy comparison. Dye examined diverse areas of policies and found that socioeconomic factors are more significant in explaining state policies than political factors. Most of this research, on a theoretical level, was driven by the hypothesized effect of public control of the political process on redistribution levels. Theoretical adjustments and methodological refinements improved our understanding of the marginal impact of political influences on such outputs as welfare expenditure levels in the states (Brace and Jewett 1995, 657).

In their studies focusing on public and elite opinion, Erikson, Wright, and McIver (1989 and 1993) explored convincing evidences for claiming a unique role for the influence of political variables in state policymaking. Their studies suggest that socioeconomic measures, so prominent in economic models, are actually surrogates for public policy demands, or public opinion. Political variables play an important role at least in the policymaking process even policy outputs are not highly correlated with political variables.

Comparative state policy theory has progressed from economic and politically deterministic accounts of policy variation to a more comprehensive, integrated theoretical explanations for why they choose different policy courses (Ringquist 1994, 25-26). Economic, political, demographic, and socioeconomic models are the most frequently used models in

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comparative state policy studies. Additional emerging models, like issue severity, have appeared on recent environmental policy studies.

Socioeconomic (or environmental) variables such as state wealth, urbanism, and education, appear to be the best predictors of state policies. These predictors work at the expense of certain political variables, such as party competition and the quality of legislative apportionment (Wright, Erikson, and McIver 1987, 982). The dominant role played by socioeconomic factors in multivariate analysis - in the expense of political indicators - has been described as more of a measurement artifact than a reflection of the actual dynamics of the policy process (Lester et al. 1983, 266). Likewise, in the environmental literature it has been suggested that socioeconomic factors may be more important in determining the level of state spending for environmental policies enacted (Lester 1980).

Much of the literature on state policy studies emphasizes the importance of socioeconomic variables. These variables are easily quantifiable and predictively potent, but their theoretical meaning continues to be unclear (Wright, Erikson, and McIver 1987, 984). Variables that are not readily measurable, like state public opinion and severity of the issue, have received lesser recognition. With continuing search for better approaches, public policies are multifaceted, and refinements in thinking about the left-side equation improve the fit of many variables from the political science arsenal (Brace and Jewett 1995).

Despite improvement in measurement and theoretical constructs, Lester and Lombard (1990) claimed that, "comparative state environmental policy research suffers from being atheoretical, too endogenic, too limited in time and plagued by numerous methodological problems." It is true that comparative state environmental policy research has those limita-

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tions and sufferings. Now, there are more reliable data and more matured theoretical and methodological framework. Therefore, it can be expected that, more reliable conclusions can be drawn.

## Toward an Integrated Theory of Comparative State Solid Waste Management

Several models purporting to explain differences in state policy outputs have been developed by researchers in political science (Ringquist 1993a, 336) as summarized and discussed above. Each model has empirical evidence to support its assumptions and each has unsupportive critics or findings or a reverse relationship is found.

The recent research in comparative state policy analysis has satisfactorily illustrated that political institutions and conditions do matter in the policy process. As well as being methodologically sound and professionally reassuring, these studies are satisfying from a theoretical standpoint. Still, these works alone do not provide an adequately rich and integrated representation of the policy process. Most of the research, even by Erikson, Wright and McIver, effuses a kind of either economics or politics conception of policy influence in the states. This is understandable, because much state policy over the last decade has sought to re-establish a role for political variables in the policy process (Ringquist 1993b, 84).

Salisbury (1968) and Hofferbert (1974) criticized early theories of public policy analyses like economics and political institutions. Later, few other researchers within political science placed empirical demands upon newer complex theories like the ideological model and environmental pressures in state policymaking studies (Hofferbert and Urice 1985; Lester and Lombard 1990; Ringquist 1993a, 1993b, and 1994). A group of other

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researchers, headed by James P. Lester, utilized various theories in a relatively mature way. They emphasized and discussed possible interrelationships of their independent variables and theories. This study is inspired from Lester et al. (1983) whose study on hazardous waste regulation was among the first to utilize both the issue severity and state institutional capacity models.

While each of the traditional or emerging models used in this study provides some insights into the determinants of state environmental protection policies, using these models against each other does not provide adequate explanation (Lester and Lombard 1990, 310). The importance of integrated models to explain state variation on environmental issues or other state policy areas is recognized. To better understand any type of environmental policy, and to answer the fundamental questions posed by comparative state policy research, a more complex theory (Ringquist 1994, 26) of state success in solid waste management is needed. It is clear that each model, with its set of concepts and indicators, work together within a complex causal system to influence state landfilling rate in particular and state solid waste management in general. Many researchers of state policy studies proposed that state environmental policies are more complex than traditional models of policy activity would imply (Ringquist 1993a, 336). Newer models, in addition to traditional economic or political models, are needed to test state environmental policy outputs and outcomes.

Liberal policies in many states (New Jersey, Louisiana, Indiana) with heavy polluting industries, resulted in severe air, land and water pollution problems. States like New Jersey succeeded environmental policies to balance economy and environment. Others, like Louisiana, Mississippi, Ohio and South Carolina are still suffering from severe pollution, including

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a hazardous waste problem. Perhaps, to better understand the effects of rising critical environmental issues and to strengthen comparative state policy analysis, other scholars utilized issue severity and organizational capability models.

It is clear that neither individual models nor integrated theory in this study is totally new. Few indicators and concepts are different than previous studies. For example, legislative professionalism is generally considered a part of political model not state institutional capacity. Similarly, administrative centralization and number of employees were considered as part of organizational (contextual) model (Cummings 1990). State environmental initiatives or innovation and environmental commitment were considered as part of policy-pertinent (perpetuation) model (Khator 1993). Theoretical constructs and most of the indicators in this study are inspired from the studies of Lester et al. (1983), Davis and Lester (1989), Cummings (1990), Khator (1993), various studies of Ringquist, and finally Hays, Esler, and Hays (1996).

Modified or recombined version of traditional models like state institutional capacity, which consist of highly traditional economic and legislative dimension in addition to relatively recent innovative capacity dimension, and emerging models like issue severity are discussed for solid waste disposal. Public opinion and liberalism model consists of traditional, but relatively less frequently tested concepts (general policy liberalism and elite liberalism). Recycling commitment model is probably unique to this study. The goal throughout the next 4 chapters is to discuss possible variables causally related to state landfilling rate and the theory behind each model.

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# CHAPTER V

# ISSUE SEVERITY MODEL

Some policy analysis scholars use the technological pressure model, which may be accepted as the precedent of the issue severity model. Technological pressure model suggests that rapid and concentrated population growth, extensive industrialization, and steadily increasing rates of public consumption create severe pollution problems. In turn, the pollution problems bring about strong pressures for environmental protection policies (Jones 1976; Lester et al. 1983). Strong environmental pressures are called "issue severity".

Issue severity is measured by using proxy or general severity variables instead of specific and direct indicators. In this study, more refined and specific (to the solid waste disposal) indicators of solid waste disposal issue were tried to find better results. Efforts to find more direct and better indicators of issue severity in this study can be seen as a response to Lester and Lombard's call (1990) for other researchers to find better indicator variables to measure the severity.

## Findings of Issue Severity Model

Many studies show that issue severity is a critical factor in designing and implementing new environmental policies. For example, Mahajam and Agarwal (1975, 441) emphasized the importance of the impairment of the physical environment and scarcity of resources on adoption of environmental policies. Consistent with Mahajan and Agarwal's



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finding, Game (1979) also demonstrated that more densely populated states. states with high levels of point source air emissions, large manufacturing outputs, and states with large populations living in areas with high air pollution levels pursue more protective air pollution regulations.

Pollution and other environmental issues are seen as important reasons for regulatory policy differences (Lester et al. 1983, 258; Sabatier 1977), and differences in policy outcomes among the states. Lester et al. (1983, 275) found that the American states are clearly responding to the existence of the hazardous waste problem. To them, the quantitative character of state regulatory activities is indeed a function of the severity of the problem itself. In other words, when they considered all the states, it appeared that where the chemical waste problem is the severest, it is a policy problem to be dealt with by state legislatures. Where it is not particularly acute, hazardous waste regulation is more likely to be promoted by bureaucratic initiatives and partisan political activity. They concluded that hazardous waste problems directly influenced the manner in which hazardous waste policy is enacted.

Wassenberg (1986, 238-245) included state population density in his explanatory state water policy study as an indicator of the severity of water pollution within the state. Wassenberg (1986, 243) discovered that indicators of state fiscal and legislative involvement in water quality regulation, state population characteristics, and the severity of the water pollution problem in a state are related to the level of Section 106 funding received by a state from 1975 to 1981.

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Okere (1995) found in his comparative hazardous waste enforcement study that states' enforcement efforts are an important function of the number of hazardous waste sites in each jurisdiction.

Contrary to the above findings -that the level of issue severity is correlated with state or local policies- some other scholars found that the severity of the issue is not important in determining state policies or policy outputs. It is suggested that state and local environmental control policies or policy outputs are either not strongly correlated with the actual level of pollution known (Cummings 1990; Dye 1979; Game 1979), or more refined indicators of issue severity are needed before a final assessment of their effects on state policy can be done (Lester and Lombard 1990). Likewise, Hays, Esler, and Hays (1996, 57) found, against their expectations, that environmental conditions do not serve to explain variation in state commitment to the environment.

**Issue Severity Model in Solid Waste Management**

Past landfilling practices have caused serious threats to public health and the environment. Reports of explosions and fires caused by methane gas buildup from decaying garbage, and the contamination of groundwater from leaking substances are more common. For decades, all types of waste were dumped directly on the ground or into large pits. While this practice caused minimal damage a century ago, the addition of toxic substances from industries and households has proven disastrous to the underlying groundwater. As a result of past abuses, many landfills are on the list of the nation's most hazardous waste sites (Superfund) compiled by USEPA. Cleanup of these sites will cost billions of dollars. Landfill

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technologies are vastly improved, however, either they are not used in every facility or even when used they do not guarantee against leaks.

Governmental rules for siting and operating waste facilities, particularly landfills, are more stringent. As of 1993, new USEPA regulations require landfill owners and operators to comply with a minimum set of standards. In anticipation of the new regulations, some old landfills have closed, and the costs to build new landfills are expected to increase. The growing awareness of the health and environmental risks posed by heavy metals and other pollutants also contributes to strong public opposition to siting new waste facilities.

The New Jersey case is a good example to explain issue severity model. The state's interest in recycling was triggered by mounting problems in solid waste management. Its comparatively early commitment to closing and cleaning dangerous sites led the Department of Environmental Protection to close by the mid-1980s more than 300 of the 350 landfills that had been in operation. Only 9 major landfills remained open in the state by 1990; consequently, many counties must contract with out-of-state landfills. This has resulted in skyrocketing solid waste disposal costs in recent years and has stimulated state and local officials to embrace less expensive -and more environmentally sound- options, such as recycling. Solid waste disposal fee increases in New Jersey counties varied from 106 % to 655 % between 1983 and 1988. As a response to this solid waste crisis, New Jersey was the first state to devise a mandatory recycling program, which was adopted by the legislature in 1986. This followed another pioneering effort, a comprehensive but voluntary recycling program that was developed in 1981 (Rabe 1994, 91-92).

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New Jersey is a high-density state with severe pollution and waste disposal problems. Pressured with severe pollution problems, legislators in New Jersey attempted highly ambiguous regulations concerning these environmental issues. The New Jersey experience of the 1980s suggests that environmental concern may secure a more permanent position atop state political agendas than in the past. No longer an issue that rises rapidly in response to the crisis of the moment but then quickly fades, the environment has remained a major area of concern for New Jersey (Rabe 1994) and many other states.

Nationwide, mandated municipal solid waste recycling is due in part to the large amount of attention drawn by a perceived lack of disposal facilities. One of the factors in the push toward reduction legislation is the perception that landfill space is dwindling. While such an assertion is debatable, the number of landfills in this country continues to decline (Kreith 1994, 5.3). Many states perceive that there is a nationwide solid waste disposal crisis because of the high generation of waste, lack of adequate landfill space, increasing cost of landfilling and stricter federal regulations. Unit based pricing for municipal solid waste collection and various educational programs focusing on reuse, grasscycling, and recycling and promoting alternative disposal methods to landfilling have reduced the landfilling rate from the late 1980s to the mid-1990s dramatically.

Landfilling rate as seen in tables 1 and 2 has declined because almost every state is willing to reduce dependence on landfill. Higher landfilling rate decline was observed in the Northeast and Great Lakes. Landfilling rate declines from 1989 to 1996 is consistent with the findings of statistical analysis of issue severity model in chapters 9 and 10.

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**Table 1. Changes of State Landfilling Rate: 1989-1996**

| States | Landfilling rate: 1996 | Landfilling rate: 1989 | Absolute difference | States | Landfilling rate: 1996 | Landfilling rate: 1989 | Absolute difference |
|---|---|---|---|---|---|---|---|
| Alabama | 75 | 93 | -18 | Montana | 93 | 96 | -3 |
| Alaska | 78 | 87 | -09 | Nebraska | 74 | 91 | -17 |
| Arizona | 86 | 100 | -14 | Nevada | 88 | 95 | -07 |
| Arkansas | 63 | 92 | -29 | N.Hampshire | 50 | 62 | -12 |
| California | 72 | 96 | -24 | New Jersey | 34 | 80 | -46 |
| Colorado | 83 | 86 | -03 | New Mexico | 88 | 99 | -11 |
| Connecticut | 17 | 37 | -20 | New York | 52 | 77 | -25 |
| Delaware | 56 | 37 | 19 | N. Carolina | 76 | 99 | -23 |
| Florida | 38 | 75 | -37 | N.Dakota | 73 | 99 | -26 |
| Georgia | 66 | 95 | -29 | Ohio | 83 | 85 | -02 |
| Hawaii | 49 | 83 | -34 | Oklahoma | 78 | 81 | -03 |
| Idaho | 90 | 95 | -05 | Oregon | 60 | 69 | -09 |
| Illinois | 76 | 92 | -16 | Pennsylvania | 66 | 95 | -29 |
| Indiana | 69 | 85 | -16 | R. Island | 77 | 87 | -10 |
| Iowa | 70 | 90 | -20 | S. Carolina | 71 | 90 | -19 |
| Kansas | 89 | 95 | -06 | S. Dakota | 62 | 99 | -37 |
| Kentucky | 82 | 100 | -18 | Tennessee | 59 | 87 | -28 |
| Louisiana | 85 | 98 | -13 | Texas | 85 | 91 | -06 |
| Maine | 28 | 37 | -09 | Utah | 73 | 88 | -15 |
| Maryland | 54 | 75 | -21 | Vermont | 40 | 78 | -38 |
| Massachuss. | 22 | 45 | -23 | Virginia | 47 | 80 | -33 |
| Michigan | 65 | 96 | -31 | Washington | 55 | 70 | -15 |
| Minnesota | 25 | 66 | -41 | W.Virginia | 87 | 100 | -13 |
| Mississippi | 85 | 96 | -11 | Wisconsin | 56 | 87 | -31 |
| Missouri | 74 | 92 | -18 | Wyoming | 96 | 95 | 01 |

Sources: Goldstein and Glenn,1997; Glenn 1990.

States with longer remaining landfill capacity and lower metro population and lower landfill tipping fees achieved lower (absolute or percentage) declines of landfilling rate. Data for 1989 and 1996 come from *Biocycle*. Analysis of survey results shows that severity of the land-based solid waste disposal issues impact state dependence on landfilling. Delaware's

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landfilling rate increased from 1989 to 1996, instead of decline because many incinerators that managed almost 50 % (a high ratio) of disposal had closed.

**Table 2. Absolute State Landfilling Rate Changes Ranked: 1989-1996**

| States | Ranked by Absolute Difference | Ranked by Percentage Difference | States | Ranked by Absolute Difference | Ranked by Percentage Difference |
|---|---|---|---|---|---|
| Minnesota | -41 | -62 | Alabama | -18 | -19 |
| New Jersey | -46 | -58 | Nebraska | -17 | -19 |
| Connecticut | -20 | -54 | Indiana | -16 | -19 |
| Massachuss. | -23 | -51 | N.Hampshire | -12 | -19 |
| Vermont | -38 | -49 | Kentucky | -18 | -18 |
| Florida | -37 | -49 | Illinois | -16 | -17 |
| Hawaii | -34 | -41 | Utah | -15 | -17 |
| Virginia | -33 | -41 | Arizona | -14 | -14 |
| S. Dakota | -37 | -37 | Louisiana | -13 | -13 |
| Wisconsin | -31 | -36 | W.Virginia | -13 | -13 |
| Michigan | -31 | -32 | Oregon | -09 | -13 |
| Arkansas | -29 | -32 | Mississippi | -11 | -11 |
| Tennessee | -28 | -32 | New Mexico | -11 | -11 |
| New York | -25 | -32 | R. Island | -10 | -11 |
| Georgia | -29 | -31 | Alaska | -09 | -10 |
| Pennsylvania | -29 | -31 | Nevada | -07 | -07 |
| Maryland | -21 | -28 | Texas | -06 | -07 |
| N.Dakota | -26 | -26 | Kansas | -06 | -06 |
| California | -24 | -25 | Idaho | -05 | -05 |
| Maine | -09 | -24 | Oklahoma | -03 | -04 |
| N. Carolina | -23 | -23 | Colorado | -03 | -03 |
| Iowa | -20 | -22 | Montana | -03 | -03 |
| S. Carolina | -19 | -21 | Ohio | -02 | -02 |
| Washington | -15 | -21 | Wyoming | 01 | 01 |
| Missouri | -18 | -20 | Delaware | 19 | 51 |

Sources: Goldstein and Glenn,1997; Glenn 1990.

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It seems that perception of the legislatures and public about the scope of solid waste disposal problems plays a role in creating new regulations or reviewing existing ones; however, it is not clear that whether solid waste related regulations affect the state solid waste disposal practices. Early regulations of municipal solid waste addressed the negative externalities associated with various disposal methods. In the 1980s, legislation began to be directed at controlling the disposal of the waste stream. In the 1990s, attention has shifted toward legislation that encourages the demand for recyclables, including tax credits and minimum content laws.

Many states have been actively studying the solid waste problem and developing solutions that include recycling, composting and waste reduction strategies. These states are aggressive in developing and funding programs for lower solid waste disposal costs. The impetus for the legislation in many cases is the lack of available landfill capacity, the NIMBY syndrome, the escalating expense of waste disposal, and the environmental consequences of disposal (Lund 1993, 2.3).

One of the factors stimulating waste reduction legislation has been the escalation of disposal prices. Although there was some easing of prices in 1991 and 1992, which may have been caused by the general economic recession and new requirements imposed by USEPA, costs are expected to rise in the future. The highest state average landfill tipping fee in the country is in New Jersey, where landfill costs average an $74 per ton as of 1991. Connecticut, Massachusetts, Minnesota, New Hampshire, and New York all have average tipping fees at or above 50 dollars per ton. Some communities in New York and Massachusetts have average tipping fees over $100 and cost of disposal garbage at incinerators or out-of-state

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disposal facilities exceed the $100 level. While it does not always hold true, the states most likely to pursue waste reduction have been those with high tipping fees (Kreith 1994, 5.4). Because of disposal cost and limited capacity, the first wave of waste reduction legislation tended to be concentrated in the Mid-Atlantic and New England states.

## Theoretical Construct: Issue Severity

### Assumptions and Measurements

Variables of issue severity model in this study are landfill tipping fees, remaining years of landfill capacity, metro population and per capita municipal solid waste generation. The general hypothesis of issue severity model in this study is the greater the solid waste problems, the lower the landfilling rate (measured as percentage of municipal solid waste land-disposed in 1996). When severity is high, states may focus on creating programs and policies to increase the share of other disposal methods (incineration, composting, recycling and source reduction) and to reduce dependence on landfills. When solid waste disposal problems arise especially the lack of community landfill, even local governments play a role to reduce the landfilling rate by applying higher collection fees which create pressure or incentive for residents to divert some of their household garbage from the waste stream.

The crucial assumption underlying this model is that when solid waste problems arise or waste disposal-related geographic and demographic burdens exist, states and local governments may promote alternative disposal methods to reduce landfilling rates. Both Lowry (1992), and Williams and Matheny (1984) found that states experiencing severe pollution or waste problems are more likely to react by increasing their policy making activity at the issue

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in hand than states that are not. However, it should be cautioned that increased policymaking activity does not always result in solving the environmental issue at hand. The effectiveness of the policies is more important than the level of activity.

Comparative state or local waste management studies are very limited and most of them focus on recycling. Therefore, it is not easy to find concepts and indicators of issue severity for solid waste management to test in the statistical analysis with the guidance of previous studies. In this study, landfill tipping fees, remaining years of landfill capacity, percent of metro population, and per capita municipal solid waste generation are used as indicators of issue severity model. Use of other indirect indicators of issue severity, like density, industrialization, and public consumption of goods were avoided. Percent of metro population may be considered as an indirect measurement of severity. Each independent variable is briefly discussed below.

## Landfill Tipping Fees

The New England, Great Lakes, Atlantic, and Pacific coastal states have the highest landfill tipping fees, and the Plains and Southern states have the lowest fees. By state, landfill costs range from highs of $50-$150 per ton in New Jersey to lows of $3-$5 per ton in South Dakota (Glenn and Ridge 1991). The higher costs in some states result from the scarcity of suitable landfill sites, dense population concentrations in metropolitan areas, tighter state environmental regulations, fees, and higher transportation and labor costs. Cost variations from state to state and region to region can influence strongly the degree of desirability of choosing alternative strategies for municipal solid waste management (SRI International 1992, 98).

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In general, the level of tipping fees is determined by landfill capacity. Scarce landfill space makes disposal costly because of soaring average landfill tipping fees. Folz and Hazlett (1991) claimed that higher tipping fees contribute to higher recycling rates. In the case of higher tipping fees, states and localities have incentives to reduce landfilling and promote alternatives, unless they transport solid wastes to distant facilities where lower tipping fees are available (Gomez-Ibanez, Meyer, and Luberoff 1992; Passell 1991). Transporting waste out of state creates conflicts among the communities and speed up the loose of landfill capacity in host states. The subhypothesis for this indicator (landfill tipping fees) is that the higher the landfill tipping fees, the lower the landfilling rate.

### Remaining Years of Landfill Capacity

Currently, many communities and states are experiencing a municipal solid waste capacity shortfalls, at least until new facilities become operational. Since remaining capacity is too short in some states or communities, interstate shipment of solid wastes to other communities or states from these communities is increasing. As a result, some states and communities are experiencing unexpected and dramatic increases in the amount of waste received from other areas at their facilities, generating concern about their own future. Therefore, not only states with very limited remaining landfill capacity, but also states with larger capacity may be willing to reduce dependence on landfills.

High per capita generation of municipal solid wastes, stringent environmental regulations, and public opposition to new or expanded landfills have caused a shortage of landfill space in some parts of the country, especially in the Northeast. New standards for landfills require liners, leachate collection and treatment, venting or recovery of methane gases, final

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cover of landfills, and environmental monitoring of the closed sites for 30 years. The new standards and regulations require expensive and advanced design and technologies to built and operate landfills. Due to the increasing cost of new or expanded landfills, shortage of landfill capacity, and higher landfill tipping fees, communities promote alternative disposal methods and try to reduce landfilling. The subhypothesis for this indicator is that the lower the remaining years of landfill capacity, the lower the landfilling rate.

### Percent of Metro Population

States with higher percentages of their population living in urban areas are more committed to environmental protection in general (Crotty 1987; Hedge and Scichinato 1993). In larger cities, it is expected that land costs are very high, or there are few if any suitable sites for a new landfill. If a landfill exist close to residential areas in larger cities, it may increase costs and public reaction. Owners of larger landfills in metropolitan areas are more likely to deal with nuisances, vermin, odor, traffic, and other issues. If landfills of a metropolitan area are not close to residential areas, than transportation costs may force cities and solid waste management entities to promote alternative disposal methods. The hypothesis is that the higher the percent of metro population, the lower the landfilling rate.

### Per Capita Solid Waste Generation

The amount of garbage disposed has more than doubled over the past 30 years, while the population has increased by only 38 %. In 1960, Americans threw out 88 million tons of garbage and by 1990 the amount reached nearly to 200 million tons.

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## Chapter Conclusion

The main hypothesis of the model for this study is that when severity of the solid waste disposal issues or physical and demographic conditions become a burden for the state lower landfilling rates can be observed. In other words, landfilling rate and issue severity are negatively related. States with longer landfill capacity and lower tipping fees may feel less pressure to reduce land-based municipal solid waste disposal. Where cost of landfilling is high like Northeastern states, alternative disposal methods are searched and promoted. It seems that high landfill tipping fees encourage not only states but also local governments to find solutions. In general, it seems that recycling, composting and source reduction are preferred instead of shipping waste to other states. Recently incineration is seen as costly and controversial, so that states do not promote incineration to reduce pressure for lack of disposal space.

Federal regulations and especially the RCRA have a tremendous impact on how states manage municipal solid wastes. Since the cost of solid waste disposal have been increased and thousands of landfills closed, states and localities focus on alternative disposal methods unless building and running landfills are cost-effective. For now, Rocky Mountain and Southern States have in general plenty of remaining landfill capacity. In these two regions, building and running landfills are relatively cheap, and public opposition to landfills is low. Especially Rocky Mountain states are sparsely populated and too far from regional recycling markets like paper mills. Therefore, solid waste disposal issues are relatively less pressurized and alternative disposal methods are not appealing to most of the states in the South and Rocky Mountain. In contrast, Northeastern and Great Lakes states generally have low

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remaining years of landfill capacity, metro population is in general high, public are very sensitive about environmental issues and disposal of municipal or any other solid wastes are expensive. States in this two regions and Florida extensively support alternative municipal solid waste disposal methods. Landfilling rate is low in the states with high landfill tipping fees.

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# CHAPTER VI

# STATE INSTITUTIONAL CAPACITY MODEL

## Introduction to State Institutional Capacity

Davis and Lester are probably the first scholars to discuss state institutional capacity model for comparative state policy analysis. Davis and Lester (1989, 67) defined state institutional capacity as "the ability and willingness of public officials within a given jurisdiction to develop and administer public policies." In their definition, the model contains three dimensions - political, fiscal, and managerial. The innovative capacity dimension of the institutional capacity model is not included in the definition by Davis and Lester. State innovative capacity is added to state institutional capacity model in this study as the fourth dimension. This study brings together four dimensions of state institutional capacity, which have been generally considered as separate models. Warren (1982) claimed that a state with high institutional capacities achieve greater responsibilities.

State institutional capacity is one of the less used models. Dimensions included in the model and measurements of each dimension vary from study to study. Each dimension of state institutional capacity (economic-fiscal, legislative-political, administrative-bureaucratic, and innovative) has been used separately by many scholars. Examining all dimensions of state institutional capacity together seems more appropriate in this study. Few studies included the first three dimensions of state institutional capacity and no study covered all four



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dimensions in a single framework (model). For this study, state institutional capacity was divided into two major dimensions as economic capacity and others that include legislative, administrative, and innovative capacities.

Most states have recently enhanced their institutional capabilities to assure greater environmental responsiveness. Lester and Lombard (1990, 302) stated that "states are no longer the weak link in intergovernmental system." States not only play stronger roles in public policy making and implementation, but also "in many instances, states have acted years ahead of the federal government in responding to social problems." (Saffell 1982, 226)

## State Economic (Fiscal) Capacity

### General Assumptions and Measurement

The economic capacity model posits a direct relationship between the economic resource base of a state and levels of policy outputs. From this standpoint, in this study it is hypothesized that there is a direct relationship between the socioeconomic resource base of a state and landfilling rates. States with higher economic capacity may be more committed using alternative waste disposal methods like recycling and source reduction. States with growing economies and higher per capita income can afford to spend an initial investment for alternative disposal methods. States with greater resources have potential to spend more on recycling and solid waste. The most frequently used economic variables for the state environmental studies are median income, state expenditures, and level of poverty. In this study, personal family income per capita, state spending per ton, and percent change of state per capita gross product were used as indicators of state economic capacity.

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## State Per Ton Waste Spending (Expenditures)

Several analysts, working in the comparative state policy tradition, have examined the impact of state resources on policy outputs. It has been generally admitted that higher spending results in a better management of the issue in hand. It was observed that few of the states with the worst pollution spent the relatively less amount of money (per capita or per square mile, etc.) to correct their environmental problems. Economic development indicators in these states show that their economic capacity is relatively lower. These states have low per capita income, high poverty, and slow economic growth; therefore, spending for economic growth and eliminating poverty are priorities over environmental quality.

Hall and Knerr (1991, 135) stated:

> The list of states devoting the most money per resident to the environment presents a highly complicated picture. The four states among the leading eight for per-capita environmental spending -New Jersey, Oregon, Washington, and California - had faced enormous pollution problems from industrial growth and population density. Their elected officials had responded with relatively bold programs and state dollars to solve environmental issues. In fact, California, New Jersey, and Oregon rank 1st, 2nd, and 5th as the states with the best environmental policies in place.

As Hall and Knerr (1991) observed, higher pollution urges states to spend more for betterment of life as long as they have economic capability to spend. California, Oregon, and New Jersey are among those. On the other end of the spectrum, states like Louisiana and Alabama are not able to spend despite enormous environmental pressures. In general, higher per capita income represents higher demand for betterment of life. To fulfill higher demands, in general, higher spending may be required. Wealthier states tend to have more liberal policies toward the environment and spent more money for environmental quality.

Agthe et al. (1996) demonstrated that economic factors such as the ability to pay and tax rates influence financial commitment of states to environmental programs. However, they

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found that state per capita expenditure on environmental programs is an insignificant determinant of state environmental program quality. They also demonstrated that state environmental program quality is more likely to be determined by political factors like legislative characteristics and voter perception of environmental issues.

For relevant analysis of this study, state spending was measured by each state's general solid and hazardous waste expenditures per ton. State waste expenditure (actual spending) rather than potential capacity (per capita income or tax capacity) seems a more concrete indicator of economic capacity. Per capita income also is worthy to test as an indicator of state economic capacity in this study.

## Personal Income Per Capita

It has been concluded that wealth and per capita income accounts for a significant amount of the variance in state efforts to protect the environment (Clarke 1979; Lester et al. 1983; Lombard 1993; Wenner 1976; Williams and Matheny 1984). For example, Lester et al. (1983, 260) found that median income accounts for a great proportion of the variance in state hazardous waste regulation.

Okere (1995) found that per capita income and total environmental expenditures account for the variation in states' hazardous waste enforcement. Robey and Tajalli (1988) found that indicators of state economic capacity is an important determinant of the variation in taxing, welfare and education policies. Saffell (1982) alerted that "while wealthy states obviously can afford to spend more money per capita on social services than can poor states, their willingness to spend should be differentiated from their ability to spend." Contrary to

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these assumptions and findings, Hays, Esler, and Hays (1996) concluded that per capita income is not significantly related to state commitment to environment.

According to Wright, Erikson, and McIver (1987, 988), the reason wealthy states tend to enact the most liberal policies is not because that they can afford the most expensive and effective policies, but because state income is a proxy for liberal policy preferences. Contrary to the above claim that liberal states are more pro environment, the analysis of the rankings of the states in the *Green Index* by Hall and Knerr (1991) shows that many conservative or Republican Northeastern and Midwestern states have pro environmental policies and high environmental spending similar to liberal states. A clean and safe environment is part of higher quality of life. Higher income states are able to spend more on all public goods, including solid waste and recycling. It has been assumed that the greater the state per capita income (wealth), the lower the landfilling rate. It is however highly possible to find many exemptions to this assumption because a sparsely populated state like Montana is more likely to spend more per capita for solid waste management.

## State Legislative-Political Capacity

### Assumptions and Measurement of Legislative Professionalism

The ability of a professional state legislature to be more responsive to the needs and concerns of its citizens has been the focus of several empirical studies. Bulanowski (1981) argued that professionalism results in legislatures that are generally innovative in many areas of public policy and generous in spending and services. Bulanowski also suggested that state legislative advisory capabilities in the science and technology area are instrumental in

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facilitating policy formulation involving complex issues. Many political scientists assume that more representative, full-time legislatures composed of better-paid legislators, with-stronger committees and assisted by more staff and research personnel should produce more responsive and innovative policies.

Legislative professionalism can mean different things to different analysts. The measurement and factors included in the legislative professionalism index are diversified. Below, in chronological order, the measurement, criteria and meaning of legislative professionalism by many scholars are discussed briefly. John Grumn and Citizens Conference on State Legislatures (CCSL) calculated two different legislative professionalism indexes in the same year (1971).

Grumn (1971, 138-140) developed a professionalism index based on compensation, length of sessions, expenditures for legislative services and operations, and a legislative services score. Using his own professionalism index, John Grumn (1971) documented that political structure can influence the outputs of a political system. Under certain conditions, political structures can reinforce or inhibit inputs from the environment. Grumn's work offered evidence that political system characteristics are intervening variables that mediate the influence of environmental characteristics on policy outputs. Environmental influences are strengthened or weakened by the structures and processes of the political system.

Concerning the measurement of legislative capability, Citizens Conference on State Legislatures (1971) produced a more detailed ranking of the states. The state legislatures were ranked according to a number of criteria in 5 general categories: functional, informed, accountable, independent, and representative. The states were rank-ordered for each of their

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characteristic and an overall rank was assigned on the basis of each state's rank on the separate measures.

Regens and Reams (1988, 61) used a factor score to indicate levels of state legislative professionalism based on a legislator's compensation, average population per senate seat, average population per house seat, length of legislative sessions, number of bills introduced, and the existence of a limit on the length of sessions.

Bowman and Kearney (1988, 76-79) claimed that the legislative professionalism concept generally refers to the legislature's capacity, consisting of expertise, seriousness, and effort in the policy-making process. To them, higher legislative capacity can not be achieved without support of staff, adequate financial resources, and suitable organizational structures and procedures to facilitate lawmaking.

Karl T. Kurtz (1990) distinguished state legislatures on the basis of compensation levels, numbers of staff, time in session, and continuity of service by legislatures. Kurtz is probably the first political scientist to emphasize the importance of continuity. Continuity may be a necessity in today's complex issues and lawmaking procedures. Without adequate time and support, most legislatures may not be able to assess the complex dimensions of the issues.

Peverill Squire (1992, 71-72) calculated a legislative professionalization index score based on legislator pay, staff members per legislator, and total days in session. Using 1986-1988 data, he ranked New York, Michigan, California, and Massachusetts as the most professionalized. At the other end of the continuum, the least professionalized were New Hampshire, Wyoming, North Dakota, Utah, and South Dakota.

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Rosenthall (1996, 175) claimed that the concept of legislative professionalization would be better operationalized by schedule and staff alone, without including compensation. To Rosenthall, schedule can be specified in terms of legislative workdays, including actual session days as well as approximation of time spent in special sessions and interim meetings. The professional and amateur legislature can be distinguished by load of schedule (heavier-lighter), and number (size) of staff (larger-smaller). Rosenthall typified California and New York as more professional and Idaho and Wyoming as amateur.

Clucas (1994, 6) believed that legislative professionalization as a concept ought to be restricted to the legislature, and not extended to include the members who comprise it. Clucas (1994, 6-7) recognized:

> Institutional professionalism and careerism are distinct concepts, and need to be analyzed separately. Institutional professionalism refers to the improvement of legislative facilities, the increase in information available to the legislature, the size and variety of legislative staffs, and probably the time spent at legislative work. This concept lends itself to relatively convenient and reasonable measurement procedures. Careerism refers to qualities of legislatures themselves, and several elements are pertinent: whether legislators work full-time or part-time at legislative tasks; how they identify themselves; whether they have substantial outside employment; and what their political ambitions are. These qualities are very difficult to measure unambiguously.

Data for legislative professionalism was obtained from Ann O'M Bowman and Richard C. Kearney's *1988 Western Political Quarterly* article. Gray and Lowery (1995, 537) believed that Bowman and Kearney's state legislative professionalism factor score (consisting of 32 state institutional variables) is the most comprehensive analysis of state government (legislative) capability. Bowman and Kearney's legislative professionalism factor score consists of four dimensions: staffing and spending, legislative accountability, executive centralization and representation.

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The first dimension, staffing and spending, includes measures of legislative compensation, staffing, and expenditures as well as indicators of gubernatorial budget and staffing levels. The second addresses legislative accountability and information management, and includes measures of legislative committee staffing patterns and use of data processing technology. Factor three, executive centralization, includes such variables as the number of elected agency heads and powers of the lieutenant governor. Representation, the last factor, addresses the issue of responsiveness and conflict management. Bowman and Kearney's factor score of legislative professionalism, combining of all four dimensions, is used in this study.

## Findings of Legislative Professionalism

According to Douglas Rose (1975, 53-94) legislative professionalism is primarily the result of population size and urbanization. Of the two influences, population size is the more important. Larger, more urbanized states have the resources necessary to support a more professional legislature and, perhaps, greater needs that require a more capable legislative body.

States with more professional legislatures appear to be more innovative in policy-making. Rose (1975, 61-63) found that states scoring higher on Grumn's index adopt innovations more quickly than more amateur bodies largely because they are simply more capable of quickly considering, examining, and deciding on the innovations of other states. Professionalism is the variable most highly correlated with policy innovation. States with more professional legislatures are more capable of acting in their own interests, different from other states. This might result in their being decidedly more innovative, or decidedly

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less innovative, than other states. Generally legislators who favored a more professional legislature also held more liberal policy attitudes.

Grumn's index of legislative professionalism and legislative competitiveness are political factors directly related to legislation. Lester et al. (1983) and Lester (1980) found Grumn's index of legislative professionalism (Grumn 1971) to be a significant and positive explanator of environmental program quality. Many other studies found that legislative professionalism is a significant factor in explaining state environmental policy outputs, including state hazardous waste regulation and state water pollution (Ringquist 1993b and 1994).

## Legislative Professionalism and Solid Waste Management

Research has demonstrated that professionalized legislatures and bureaucrats more aggressively pursue air pollution policies, hazardous waste regulation, and other environmental policies (Hays, Esler, and Hays 1996; Ringquist 1993b, Ringquist, 1994). Ingram, Laney, and McClain (1979, 303) stated that "legislators respond to issues on the basis of their assessment of the risks and rewards involved in taking certain actions." This finding implies that the perception of legislators about a particular issue is the main factor in creating public policies, not the professionalism of legislators or the importance of the issue. In general, greater professionalism has been associated with higher levels of government activism and intervention. Solid waste management requires activism and intervention. Therefore, a more professionalized government should be associated with greater commitment to solve solid waste problems and promote more environmentally acceptable disposal methods such as recycling and source reduction.

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More professionalized legislatures are not only more committed to environmental issues, but they also are able to create more effective regulation or programs to achieve a specific goal like reducing landfilling. Most studies of state policy research have found that professional legislatures have higher capacity to produce better policy results. Contrary to general findings, Agthe et al. (1996) believed that professional legislatures do not necessarily provide more expensive or less expensive programs. A legislature that designs more efficient and effective programs might spend less on each program. In this study, it is hypothesized that more professionalized legislatures, based on the factor score calculated by Bowman and Kearney (1988), are more likely to be able to produce solid waste programs of better quality.

## State Innovative Capacity

### Assumptions and Measurement of Innovative Capacity

One of the important questions in this study is whether there is a pattern or relationship between the level of environmental innovativeness and landfilling rates. Grouping or scoring states according to their environmental innovations or initiatives may help to better understand state landfilling rats.

Several researchers have calculated degree or score of state innovativeness. Walker (1969) calculated innovativeness scores for the 48 continental American states based on the adoption pattern of 88 policies. Walker's innovativeness score indicates the *speed* with which states accept new programs. Walker's analysis shows that the larger, wealthier, and more urbanized states of the Northeast and Midwest have the highest innovation scores. A limited innovativeness score is calculated by Virginia Gray (1973) based on 12 policies.

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Other more recent studies scoring states on environmental initiatives (Hall and Knerr 1991) and commitment show that, in general, Southern and Rocky Mountain states rank low in the area of environmental initiatives. Massachusetts, New Jersey, Connecticut, Oregon, Minnesota are scored high both in general innovation (including various policy areas) and environmental innovation. States with high general and environmental innovation scores are well coincided with those experiencing low landfilling.

## Increasing State Innovations and American Federalism

Boeckelman (1992, 365) stated that "there can be little doubt that the states have been policy innovators in recent years." Lester (1990, 72), in a discussion of the government capacity and innovation in state governments stated:

> Some argue that state governments lack the expertise available to national government, that they tend toward parochialism, that they are unwilling or unable to raise revenues to meet service demands, and that they are dominated by a conservative, business-oriented elite.

Proponents of decentralization contend that the institutional reforms of the 1970s and 1980s changed all this. Compared with the federal government, state governments, they argue, are in closer touch with problems, more flexible and innovative. Furthermore, Heing (1985) assumed that state governments are better able create more appropriate responses to their individual conditions and preferences.

Students of comparative state politics and policy have considered the diffusion of innovation as a central element in the process of state policy formulation and agenda setting. The role of states as policy innovators has gained increasing attention in recent years. "With new federal policies and revisions of older federal policies promising greater flexibility for

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states, states confront greater challenges than ever before in the development of innovative responses to problems" (Hays, Esler, and Hays 1996, 23). Savage (1985) summarized key findings on the diffusion of policy innovations in a federal system and concluded that some states are more innovative and therefore more likely to adopt new programs.

Frequently, states or cities take innovative initiatives before the federal government does. Many states had equal pay legislation for women and open housing laws before the federal government nationalized these policies (Lineberry 1977, 64). The federal government attempted to significantly reduce its role in directing and funding environmental regulation during the 1980s. The states' responses to this challenge have included an unusually diverse array of programmatic innovations. For example, New Jersey, one of the most innovative states in environmental regulation, rivaled the federal government during the 1980s and 1990s. New Jersey, Minnesota, California, and Oregon are key states in environmental regulation and innovations in the United States.

## Classification of States on Environmental Innovations and Initiatives

Walker (1969) identified the most rapid adopters and the slowest states by using 88 measures of different innovations from the last 100 years. The five most innovative states are New York, Massachusetts, New Jersey, California and Michigan. The five least innovative states are Texas, South Carolina, Wyoming, Nevada and Mississippi. Walker (1969) explored the general tendency toward innovativeness of state governments and concluded that states have relative levels of innovativeness, and that it is possible to attribute general innovative tendencies to state legislatures. Walker's pioneering study on state innovation

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examined numerous state programs and concluded that certain identifiable states adopted new programs first. All states are not innovators for all policies. They may adopt some policies relatively early and others relatively late.

Gray's research (1973) challenged Walker's contention that innovative states lead regardless of the policy area or time period involved. Gray (1973) examined 12 policies and found that state innovativeness often depends upon on the issue and time period characterizing the policy. She maintained that, depending on the issue and the time frame, various states can be classified as leaders, middle adopters or laggards. Gray (1973) identified optimal adapter categories as innovators (8), early adopters (9), late adopters (19), and laggards (12).

Robert Savage (1978, 212-24) found that innovativeness is a pervasive and time specific factor among the states. Some states have been identified as leaders and others as laggards in adopting innovative policies. Lester (1990, 73-74) found four groups of states in terms of their commitment to environment:

> Some states have taken initiatives to revitalize their institutional structures to respond pressures created during Reagan Administration and increasing stringent federal regulations in last two decades. A state's response to New Federalism depends upon two different, but nevertheless complementary dimensions: its commitment to environmental protection activities and its institutional capabilities. Based on these two dimensions, the states can be divided into four groups: 1) progressives, 2) strugglers, 3) delayers, and 4) regressives. This classification describes the most probable path for state environmental policy development in recent years. ... The first group of states is those with a high commitment to environmental protection coupled with strong institutional capabilities. ... A second category of states includes those with a strong commitment to environmental protection but with limited institutional capacities. The third group of states - delayers- is those with a strong institutional capacity but with a limited commitment to environmental protection. ... States with weak institutional capacities as well as a weak commitment to environmental protection includes states like Mississippi, Nebraska, Wyoming. ... The fourth group of states is regressives. For these regressive states decentralization of environmental programs will likely be a disaster. These states may continue to promote economic development at the expense of environmental quality.

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## Why Are Some States More Innovative and How Do Innovations Diffuse?

Berry and Berry (1990 and 1992) found, at least for the lottery and for state taxes, that both the internal determinants model and regional diffusion model can explain policy adoptions. Berry and Berry (1990, 400) assumed that the probability that a state without a lottery will adopt one in a given year is determined by both the internal characteristics of states and the previous pattern of lottery adoptions by nearby states. This assumption is based on regional diffusion model that asserts that states are more likely to adopt a policy as the number of nearby states that have already adopted the policy increases. In contrast, the national interaction model presumes a national communication network among state officials in which officials of adopter states interact freely and mix completely with officials of non-adopter states.

Studies of innovation often seek to identify innovative or path breaking states. When considering a new policy adoption, states frequently look to path breakers for policy leadership. This approach assumes that the capacity for policy innovation is limited to early adopting states. In contrast, more recent research on innovation focuses on policy reinvention, a concept borrowed from communications research. Reinvention considers how states alter and adapt innovations, because it is believed that most states reshape an innovation based on their own needs and circumstances (Hays, Esler, and Hays 1996).

## State Solid Waste Innovations and Initiatives

West Coast and Northeastern states are known as the most innovative states in the environmental field including solid waste management. Some states have replicated portions of

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laws from other states that have developed viable solutions. For example, Pennsylvania passed omnibus solid waste legislation as early as 1968. Twelve years later, that legislation was updated (Kreith 1994, 5.7-5.8). This law was later adapted by various states. However, not all innovations spread to other states. For example, California recycling enterprise zones have had little interest from other states. California also has a unique bottle bill, which has yet to be adopted by any other state.

Oregon passed one of the first significant state-level solid waste legislation. The first attempt at making manufacturers responsible for products came in the 1970s with the passage of mandatory deposits on selected beverage containers. The first mandatory deposit law was passed in 1971 in Oregon. Since then, until 1990, 8 more states have passed mandatory deposit legislation, the last being New York in 1983. The principal focus of these laws is the packages used for soft drink containers.

When states first started to establish specific solid waste goals, they were primarily recycling goals. New Jersey, one of the first states to put a goal in legislation back in 1987, does not even allow the composting of leaves to count for part of the 25 % recycling goal. Shortly after, many states established recycling or waste reduction goals by following New Jersey. Over the last several years, the focus has been changed from strictly recycling, and yard waste composting to overall waste reduction.

The prototype of recycling legislation in this country was Oregon's "Opportunity to Recycle" Act. In this type of legislative scheme, municipalities are required to provide some form of recycling programs, but the municipalities are not required to pass ordinances requiring participation by waste generators. As of 1993, besides Oregon, 12 other states have

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passed legislation requiring development of some forms of local government recycling programs. In 6 of those states counties are charged with the responsibility. Nevada's law applies only to counties with populations of more than 25,000. Three states (Arizona, California, and Washington) target both cities and counties (Lund 1993, 5.15-5.16).

Banning specific types of waste from disposal facilities is another initiative. There is no more direct approach to waste reduction than banning specific types of waste from disposal facilities. For municipal solid waste. bans were first ushered in back in 1984 when Minnesota passed legislation banning the disposal of tires in landfills. Since then at least 42 additional states have passed bans on one or more waste materials (Lund 1993, 5.16). More detailed information about state environmental innovativeness can be found in the various publications of the Council of State Governments (CSG), Lexington, Kentucky, which publishes both environmental and other innovators and innovations.

## State Administrative Capacity

### Formulation of Successful Policies and Bureaucracy

The linkage between state bureaucratic structure and policy has been empirically examined in some studies. Given the increasingly important role played by bureaucratic policy makers in the policy process, they deserve careful attention in any policy analysis (Downs 1976, 10-11). It appears that structural consolidation as well as the ability of any organization to provide scientific information for bureaucratic decision making in the environmental arena may affect the formulation of policy. A single-purpose agency may encourage the adoption of a tougher regulatory approach (Lester et al. 1983, 263).

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The character and resources (human, economic, and technical) of the bureaucracy responsible for policy making and implementation are crucial to program success (Ringquist 1993c, 1026). An agency or program handicapped by inadequate financial and personnel resources is an unlikely vehicle for effective policymaking and implementation (Mazmanian and Sabatier 1989; Rourke 1984). However, not only the number of personnel but also the quality of personnel is important. Structural organization of an agency also is considered an important factor in a successful bureaucracy.

## Bureaucratic Consolidation and Fragmentation

Edwards III (1980, 134) defined fragmentation as "the dispersion of responsibility for a policy area among several organizational units." The movement for administrative reform advocated consolidation of administrative agencies into a small number of departments, organized by functions whose heads are appointed and controlled by the governor. This reorganization would help to eliminate jurisdictional overlap, jealousies, and conflicts among multiple agencies in a specific functional area. In the earlier studies, Sabatier (1977), and Lester (1980) found that institutional fragmentation of the environmental bureaucracy has a negative impact on pollution control regulations. In this regard, it is argued that bureaucratic fragmentation greatly limits both technical expertise and fiscal resources for dealing with environmental issues. It is therefore suggested that creating a new, single-purpose pollution control agency may well encourage the adoption of a tougher regulatory approach.

The difference between creating a strong central agency for a specific goal like solid waste management and greater centralization of all state government are different concepts. For example, Francis (1991, 74-75) calculated a general index of centralization in state

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decision making. His index score considers all the agencies and the relationships between governor, legislatures, and bureaucratic organizations. This is different than creating a superagency for solid waste management like in California. Visual analysis of the centralization index score by Francis (1991) shows that there is no clear pattern between the degree of centralization and state landfilling rate. For example, Francis found that Alabama and New Jersey are highly centralized and Nevada and Florida are very decentralized. However, New Jersey and Florida have low landfilling rates and Alabama and Nevada very high.

Bureaucratic consolidation may directly promote environmental policy formulation by concentrating both fiscal resources and bureaucratic expertise into a single agency, which may then be applied to the particular environmental problem at hand. Administrative capacity of government is a much neglected but vitally important factor shaping the policy choices of communities. Without the requisite knowledge, technical skills or expertise, many policies cannot be considered (Feiock and West 1993, 403). The capacity of the bureaucracy also may shape policy choices in that more professional agency directors may be more aware of innovative approaches and press for their adoption and implementation (Barrilleaux, Feiock, and Crew 1992).

## Assumptions and Measurement of Bureaucratic Consolidation

The number of staff per capita working on both state environmental department and solid waste division or number of total staff working on both agencies might be an indicator but is subject to various biases. First, not the number of staff but the quality, expertise and discretion of the staff are more important. Second, per capita indicator is misleading because

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the more staff means the more people with various skills and expertise which is critical to create a policy.

Edwards III (1980, 134) hypothesized that "the more actors and agencies involved with a particular policy and the more interdependent their decisions, the less the probability of successful implementation." The hypothesis for administrative capacity is that the more consolidated the state environmental bureaucracy, the lower the landfilling rate. Lester et al. (1983, 264) calculated bureaucratic consolidation by weighting each state's structure by the number of years it has been in place up to 1976.

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# CHAPTER VII

# LIBERALISM AND THE PUBLIC OPINION MODEL

In state environmental policy research, political pressure is usually measured as strength or number of members of special interest groups. In this study state public opinion (measured as self-ideological identification: liberal-conservative) and elite opinion and commitment (measured as pro environmental votes in the Congress scored by League of Conservative Voters) are used.

## State Public Opinion (General Policy Liberalism)

More direct consideration of public opinion on policy has been among the most important advances in the study of public policies in the states during the 1980s, according to Brace and Jewett (1995, 658). Wright, Erikson, and McIver (1985 and 1987) claimed that public attitudes impact state public policies. In their 1987 study, they stated that "in comparative state policy literature, however, public opinion has been largely ignored. One reason is that being a political variable subjects public opinion to suspicion of impotence" (Wright, Erikson and McIver 1987, 981-82).

### Measurement and Basic Assumptions of Public Opinion

Holbrook-Provov and Poe (1987, 400) mentioned 5 alternative measures of state political ideology based on 3 categories: a survey measure, policy measures, and roll-call measures. Wright, Erikson, and McIver (1985) noted the small sample problem, resulting



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from the use of national samples to estimate state public opinion, and used this to develop pooled survey-based estimates of partisanship and ideology for the states by combining national surveys over an extended period. Holbrook-Provov and Poe (1987, 400) stated that "the most straightforward method for measuring political ideology is the public opinion survey" based on respondents self-identification on a liberal-conservative continuum. Wright, Erikson and McIver (1985, and 1987) utilized this method in their calculations of public opinion.

In 1983, Rosenstone developed the New Deal social welfare liberalism dimension (NDSWL) as a measurement of general policy liberalism based on policy evaluations. Klingman and Lammers (1984) developed another composite index of state policy liberalism. Klingman and Lammers (1984, 605) implied that the general policy liberalism factor as a measure of state political ideology related to political liberalism. Klingman and Lammers (1984) created their general policy liberalism factor based on several distinct policy measures, which are combined into a single, much broader, policy measure.

According to Holbrook-Provov and Poe, (1987, 404), Rosenstone's liberalism measure differs substantially from the general policy liberalism factor by Klingman and Lammers. Rosenstone claimed that the degree to which a state supports New Deal social welfare policies is dependent upon the state's citizens themselves preferring liberal policies.

State public opinion can be measured as liberal-conservative ideological identification as Wright, Erikson and McIver did. State public opinion, as measured by the ideological disposition of state electorates, is strongly related to the liberal versus conservative content of state policies (Wright, Erikson, and McIver 1987, 996).

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> To account for the strong opinion-policy correlation, it is important to consider that state policy liberalism is the product of numerous policy decisions and nondecisions summed across not only multiple policy areas but also across time. The weighted sum of a state's policies at any one time reflects the accumulation of state policies over many years and even decades. We need not conceptualize the opinion-policy linkage as an immediate responsiveness of state policy in any year to the voice of public opinion in that year. (Wright, Erikson, and McIver 1987, 997-98).

State public opinion is of paramount importance in social and redistributive policies like welfare policy. State public opinion however may not be a very appropriate indicator of environmental policies because of different issue salience. Therefore, it is expected that state landfilling rate (dependent variable) and public opinion may not be strongly correlated because the measurement of opinion as liberalism is based on a left-right ideological spectrum. This spectrum may be irrelevant to environmental issues, including land-based solid waste management because environmental concerns often cut across traditional liberal-conservative boundaries (Capra and Spretnak 1984; Inglehart 1977).

In a further study in 1993, Erikson, Wright, and McIver provided a measure of state public opinion liberalism. The public opinion measure developed by Erikson, Wright, and McIver (1993) was used in several comparative state policy studies. This measure was based on liberal and conservative self-identification and covers the period from 1976 to 1988.

## Public Opinion, Political Culture, and Public Policies Are Interrelated

Direct measures of public opinion are needed to assess the responsiveness of states to the preferences of their citizens. A lack of direct measurement of public opinion, except polls and surveys, causes difficulties in disclosing the relationship between public opinion and public policies. Furthermore, if there is a relationship as assumed, it is hard to decide how public opinion transformed into public policies. Despite these problems, "still, some scholars

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have seen the relationship between public opinion and state policy as sufficiently important to risk assessing the role of public opinion" (Wright, Erikson, and McIver 1987, 983). In addition to examining the relationship between ideological positions and public policies, some political science researchers have examined the relationship between public policies and political cultures. The discussion about political cultures and public policies are expanded later in this chapter.

Page and Shapiro (1983, 175) warned that "an observed relationship between opinion and policy could be spurious, the product of a concurrent influence upon both by some outside factor." Other scholars also cautioned that the correlation found in some studies between policy and opinion might be causally reversed. This means that politicians and policies themselves affect public opinion instead of the impact of public opinion on policy outcomes. Others noted that the relationship between public opinion and policy outcomes happens through intervening factors. For example, Erikson, Wright and McIver (1989) demonstrated that "public opinion influences public policy directly and indirectly through the intervening factors of party identification, party elite, and the composition of the state legislature." This suggests that state political systems respond through institutional intermediaries to the demands of the public. Politics, it seems, does matter, even when controlling for levels of wealth and economic development (Ringquist 1993b, 84).

Earlier in this dissertation, it was hypothesized that public opinion influences policy. Despite the fact that no relationship has been reported by few studies, most of the studies of comparative public policy do show a relationship between public opinion and policy. Weber et al. (1972) reported that strong relationships exist between public opinion and two policies:

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gun controls and public accommodations. They found no relationship between public opinion and policies on parochial school aid, right-to-work policy, and teacher unionization. In a more recent study related to environment, Hedge and Scichitano (1993) demonstrated that states with more liberal populations are generally more committed to environmental protection. In few studies, the findings did not support state public opinion. When state commitment to specific media was analyzed, however, liberalism was found to be related only weakly to increased regulation of water quality, but not at all to enhanced regulation of air quality (Ringquist 1993c).

Rosenstone (1983, 158) explicitly stated that "the more liberal its citizens, the more a state's policies will embrace the precepts of New Deal social welfare liberalism." Wright, Erikson, and McIver (1987) found that state opinion liberalism has a strong and significant impact upon public policy in the states when they used direct measurement of public opinion. In the presence of state public opinion, the traditionally dominant economic development variables become insignificant. Klingman and Lammers (1984) found that liberalism is tied to a state's political culture. Perhaps ideological position of the citizens and political culture affect policymaking together. It is not easy to distinguish one from the other.

## Geographical and Political Cultures and Subcultures

### Political Cultures and Subcultures

State political culture is a variable with some similarities to state public opinion. The Elazar-based political culture may be considered as a rough measure of public opinion (Wright, Erikson, and McIver 1987, 983). State political culture is usually measured as a

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variant of Elazar's categorization of moralistic, individualistic, and traditionalistic political cultures (Elazar 1972; Sharkansky 1975; Kincaid 1982). Daniel Elazar's tripartite classification of political cultures emerged during the 1970s as one of the leading predictors of the interstate variance in public policy outputs.

> Politics in the three political cultures can be described with respect to (1) development of political participation, (2) development of governmental bureaucracy, and (3) amount of government intervention in the society. ... For students of state government, political culture helps to explain differences in political attitudes and governmental concerns from state to state. In large part, political culture determines what policies can be expected from state government. (Saffell 1982, 6-7).

According to Elazar (1972, 100-01), each culture conveys a different understanding of the purpose of political action and governmental policy. The most crucial of these understandings is the legitimacy of mass political participation and the acceptable scope of government policy making. Elazar considered the impact of political culture on public policy as being transmitted through the matrix of political attitudes and expectations that grow out of each culture. Morgan and Watson (1991, 39) noted that political culture is primarily a contextual force in which certain environmental variables (e.g., affluence, political ideology) might affect political behavior and policies somewhat differently depending on variations in cultural context. Morgan and Watson (1991, 44-45) hypothesized that political culture affects state political behavior and process. However, their findings demonstrated that political culture's influence on political institutions is minimal.

The Elazar classification of subcultures has some explanatory value on public policies, but the explanations differ from scholar to scholar and from policies to policies . For example, Ira Sharkansky (1975, 262) found some limited success in utilizing the classification to predict public policy outcomes, but expressed reservations about the

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reliability of the subcultures designations as applied to some states. Sharkansky (1975, 262) noted that "even when such factors as region, income, and urbanization are constant, political cultures produce significant consequences for government action."

Francis and Thomas (1991, 26-27) expressed that there is a close correlation between subcultures of Elazar and political ideologies based on a conservative-liberal scale. According to them, traditionalistic states tend to be more conservative and have less activist governments. In line with political culture explanations, predominantly moralistic states like North Dakota, Minnesota, Oregon, and Michigan often have more activist governments.

Inglehart (1988) indicated that there is a complex interplay between culture and environment that Elazar does not treat extensively. Political attitudes and institutions have been strongly influenced by the environment. Elazar's schema does not explain the relationship between culture and environment. Similarly, Francis and Thomas (1991) emphasized that interplay between economic well-being and policy change may help to understand some of these relationships. More specifically, Inglehart (1988) observed that there is a relationship between sustained prosperity of the post-World War II period and appreciation of environmental quality. This explanation provides for reason for the first Earth Day in 1970, many federal environmental protection efforts and the enactment of the 1976 Resource Conservation and Recovery Act, and many other environmental activities.

It is mentioned in chapter 6 that higher environmental commitment and initiatives and economic wealth coincided with states like California, Washington, Connecticut. Saffell (1982, 225) believes that political culture and established traditions influence policymaking. In general, states with moralistic cultures tend to have more progressive programs in

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environmental protection and states with more traditionalistic figures tend to be less committed to environmental protection.

## Geographic Cultures and Subcultures

The United States Census Bureau divides the United States into regions, each of which encompasses a number of states. Journalist Joel Garreau in 1981 proposed an alternative geographical conceptualization of the country. His scheme (Garreau 1981) called *The Nine Nations of North America*, postulates that "America" does not really exist at all. Garreau claimed that there actually are nine separate "nations" within the geographical boundaries of the United States and Canada, each with its own priorities and customs. According to this, for example, the "Breadbasket" is home to "Middle America," where people are largely conservative and hard-working. "Ecotopia" in the Northwest United States is environmentally oriented and associated with "New Age" philosophy.

Garreau's insights are quite interesting, and many of his observations make intuitive sense. For example, subsequent work on this categorization scheme verifies that occupants of "Ecotopia" are more likely to be employed in executive or professional positions, are more likely to be college-educated and politically liberal, and tend to be highly inner directed. Generalizations need to be carefully examined because *The Nine Nations* are largely based upon personal observations and guesses about how to divide the country.

Some students of geographical cultures noted that the "nations" themselves contain pockets that most likely better belong to other "nations". For example, the nation "Dixie" covers a large portion of the Southeast, including most parts of Florida. Southern Florida is a separate culture called "The Islands". The state of Florida, in terms of environmental

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commitment, spending, and regulations, has very similar characteristics with New England and the Great Lakes. More systematic work that explicitly examined the values of people living in each nation has not provided overwhelming support for the Nine Nations typology per se (Kahle 1986).

Northeastern and Pacific coast states are known as more pro-environmentalist. Thomas (1991, 513-14) expected that urbanization and environmental interest groups are likely to increase pressures for controls on pollutants and land use planning. According to Thomas, political pressures concerning environmental issues are likely to intensify the existing opposition in many states between those favoring economic development and those advocating environmental concerns regardless of the regional differences. This may be more obvious in states with less diversified economies where any economic development investments, regardless of environmental impacts, have been supported.

Regional patterns of land-based solid waste disposal can be observed. For example, with the exception of Florida and Arkansas in the South, all southern and Rocky Mountain states have high landfilling rates. With the exception of Alaska, all 4 Western Coast states and Hawaii have low landfilling rates. Two separate lines can be easily drawn to separate all the low and high landfilling rate states with the exception of only Arkansas and Florida. At the Great Lakes area, this line needs to be extended to include Iowa, and excludes West Virginia.

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## Environmental Commitment, Political Elite Ideology, and Interest Groups

### Environmental Opinion and Voting of Political Elite: League of Conservative Voters (LCV) Score

To keep score of pro and anti environmental votes inside Congress, environmental organizations have created the League of Conservative Voters (LCV) to monitor voting behavior and endorse candidates. Each year since 1970, the LCV has chosen about a dozen roll-call votes on environmental issues. The LCV score has limitations because it is based on the voting records of *federal* policymakers, not *state* officials. "However, it should reflect the willingness of the voters in each state to send liberal representatives to the United States House of Representatives" (Buchanan, Cappelleri, and Ohsfeldt 1991, 71) and Senate. An analysis of voting patterns for entire delegations reveals the strong correlation between what drives the economy in a politician's home district and how he or she votes in Washington (Hall and Knerr 1991, 118).

Environmental issues used in the calculation of LCV scores may include curbing nuclear power, cutting pork-barrel water projects, strengthening pollution standards, protecting wetlands and national forests, promoting alternative energy. Scorecards by League of Conservation Voters from 1985-1990 show that the delegations (House and Senate members) with the 10 worst average scores come from energy-producing states – Wyoming, Utah, Alaska, Arizona, Kentucky, Mississippi, Louisiana, and Alabama or from the farming states of Idaho and Nebraska. In general, liberal states with serious pollution problems that need government intervention like Delaware, New Jersey, New York and states where dependency on energy sources is minimal, including Vermont, Massachusetts, Rhode Island,

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Connecticut, Wisconsin, and Washington ranked the best. Unfortunately, few waste related issues were included in calculation of the LCV score; however, best and worst ranked states roughly coincide with the lowest and highest state landfilling rate.

## Ideological and Party Cleavages

### *Electoral Party-Elite Ideology*

Hays, Esler, and Hays (1996, 49) used electoral party-elite ideology scores from Erikson, Wright, and McIver (1993) to measure general policy liberalism or ideological preferences of state policymakers. Erikson, Wright, and McIver (1993, 96-119) calculated an ideological midpoint to measure elite ideology. This ideological midpoint is based on averaging ideology scores for elected officials from the Democratic and Republican parties in each state. "A number of studies suggest that in terms of policy outcomes it generally makes a significant difference whether a Republican or a Democrat is elected to Congress" (Dunlap and Allen 1976, 396).

David Nice (1983) measured state ideological preferences as the state two-party vote in the ideological Nixon-McGovern presidential election of 1972. Nice found strong and significant relationships between the McGovern vote and several indicators of state policy. However, in general, comprehensive models of ideological preferences and other research on party dominance or strength of the Democrat party indicated that dominance of one party in a state or competition among parties are not strong indicators of policies. Hays, Esler, and Hays (1995, 49) believed that "environmental concerns ordinarily cross party boundaries."

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Therefore, current research generally recognizes elite ideology and public opinion as more important determinants of policy outcomes rather than partisanship.

> Most observers would agree that Democratic and Republican elites differ ideologically in their values and in certain manifestations of behavior. ... Although Republican and Democratic candidates diverge in their campaign rhetoric and even in their personal values, perhaps Republican and Democratic politicians ultimately enact the same policies when given the responsibility of governing. (Erikson, Wright, and McIver 1989, 730)

The study of Lester et al. (1983, 277) on hazardous waste regulation is one of the examples where liberalism was to be positively correlated with stringent hazardous waste regulation. They believed that there is no significant ideological difference between liberals and conservatives concerning the regulation of hazardous waste. Despite the fact that there is no empirical evidence in their study, they did not deny that there is a difference in policy making and outputs between these two main ideologies.

> Clearly, the ideological preferences of state electorates play an important role in determining the ideological tone of state policies. Partisan elections would seem a likely conduit for this flow of causality, with liberal legislation and conservative states electing Republicans who enact conservative legislation. (Erikson, Wright, McIver 1989, 730)

Democrats in Congress vote for environmental measures almost twice as often as Republicans. During 1985-1990, House Democrats voted right (pro environment) 68 % of the time, compared to an average score of 36 % for Republicans. In the Senate, the gap narrowed to 63 % for Democrats versus 36 % for Republicans. Seven states - Mississippi, Utah, Alaska, Idaho, Arizona, Louisiana, and Alabama - stayed among the worst 10 from 1970 through 1990. Eight states have remained in the top 10 since 1970: Connecticut, Maine, Massachusetts, New Jersey, Rhode Island, Vermont, Wisconsin, and New York. New Hampshire improved its ranking between periods, from 22$^{nd}$ to 12$^{th}$ (Hall and Knerr 1991).

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***Political Party Competition***

Some "political scientists are predisposed to believe that competitive participatory political systems are more responsive to citizen demands than non-competitive, non-participatory systems" (Robey and Tajalli 1988, 59). Erikson, Wright, and McIver assumed that there is no relationship between political party competition and responsiveness of policymakers or political party competition and public policies. Erikson, Wright, and McIver (1989, 730-31) stated that

> ... not only are the ideological preferences of state electorates uncorrelated with the partisan composition of state elected officials but they are also unrelated to the electorate's partisan differences. ... Democratic states do elect the most Democrats to state office. But the most Democratic electorates are not unusually liberal. And the Democratic legislatures they elect do not enact unusually liberal legislation. ... The most liberal state electorates do elect legislators who enact the most liberal legislation, even with the absence of any obvious partisan linkage.

In summary, Erikson, Wright, and McIver (1989, 743) concluded that "party control of the state legislature is not a particularly good predictor of state policy." Therefore, party competition was not used in this study as an independent variable. However, it is worth examining the literature on this subject because it is appealing to many political scientists. The answer is not that electoral politics is unimportant but precisely the opposite. Erikson, Wright, and McIver (1989) found strong evidence that: (1) party positions respond to state opinion; (2) state elections reward and punish state parties based on their responsiveness to public opinion; and (3) Republican and Democratic legislators moderate their positions when making policy. Downsian model of the electoral process assumes that electorally responsive parties should respond to state opinion regardless of their ideological choices (Downs 1957).

Erikson, Wright, and McIver (1989 and 1993) utilized the well-known electoral theory of Anthony Downs. Downs showed that an issue-motivated electorate would drive

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political parties toward the center of the political spectrum, thereby providing policy representation no matter which party won elections. Consistently with Downs theory, Erikson, Wright, and McIver (1989, 737-38) wrote that

> State party positions vary in response to state opinion: the more liberal the state, the more liberal the Democratic Party and the more liberal the Republican Party. On the one hand, activists push state parties away from the center; on the other hand, electoral considerations push state parties back toward the center.

As Erikson, Wright, and McIver (1989, 734) indicated, party elite liberalism is important in determining the direction and liberalism of policies. They offered 4 separate indicators of the ideological preferences of Democratic and Republican state elites, which they combined into a comprehensive measure of elite opinion. The 4 indicators of party elite liberalism consist of conservatism-liberalism of: (1) congressional candidates, (2) state legislators, (3) local party chairmen, and (4) national convention delegates.

## Membership and Strength of Environmental Organizations

Harmon Ziegler offered a general interest group strength classification in 1983. He grouped and coded states as: (1) strong interest group states, (2) moderate-strength interest group states, and (3) weak-interest group states. This classification is based on the assumption that citizens can easily get organized to impact public policies according to their preferences. Based on this pressure (interest) group model, citizen preferences are translated into public policies through the intermediary function of organized groups. This theory does not tell whether interest groups or the more informal meetings between citizens and policymakers provide linkages to translate preferences into policies. Another model, the socialization linkage model, elaborated by Godwin and Shepard (1976), assumes that

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officials either share preferences with their constituents or want to represent interests of their constituency regardless of political system characteristics (Jackson 1992, 36).

Thomas and Hrebenar (1990, ch.3) classified states based on strength of interest groups' influence. Some states are dominated by interest groups instead of political institutions such as governor, the political parties, and the bureaucracy. Some other states are subordinated to interest groups. In the second group of states, the impact of interest groups is weaker. Connecticut, Delaware, Minnesota, Rhode Island, and Vermont are among the states where interest group strength is weak. On the other end of spectrum, Alabama, Alaska, Louisiana, Mississippi, New Mexico, South Carolina, Tennessee, and West Virginia stand. Interestingly, dominated states, against the general assumption of interest group theory, have higher landfilling rate with the exception of Florida; and all the subordinated states have low landfilling rate.

## Chapter Conclusion

Ringquist (1994, 39) found that political and ideological factors (LCV score) are most important in hazardous waste management probably because of the high saliency and politics of fear surrounding hazardous waste disposal. Ringquist further found that the ideological leanings of state citizens are important in water pollution control and hazardous waste management, but environmentalism of the political elite is more important in state hazardous waste regulation.

Weber and Shaffer (1972, 684) noted:

> Those states with competitive political party systems, equitable legislative apportionment, professionalized legislatures, and participant political cultures are expected to make policies which are responsive to citizens' preferences because these political system characteristics are assumed to facilitate the expression of citizens' preferences.

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Many studies have shown that ideological and ambient environmental concerns may prompt a state to adopt a particular type of policy, and these concerns must be acted upon by a set of institutional intermediaries if they are to become public policy (Ringquist 1994, 27). Some researchers in state policy analysis theorized that ideological and environmental concerns are transmitted to policies through organized special interest groups. Some other researchers believed that professional staff and criteria (Hird 1991) or politicians directly understand and pursue to include the concerns in their policy decisions.

Harrigan (1994: 122) points out:

> Public opinion does not have a direct effect on most issues that governments face. Public opinion is most effective on visible and highly emotional issues. ... There is some evidence that elected public officials share a consensus of values with the majority of their constituents. By contrast, interest groups exert a very strong influence on public policy, although their interest varies from state to state" or from issue to issue.

Kalt and Zupan (1984) assume that members of the political system may pursue their policy goals by channeling and altering the pattern of interests entering the political system, by discounting group pressures, and following their *own* ideological dispositions. The political system itself consists of political parties, governmental institutions, and the attitudes of the elite members of each.

> The political elites approach assumes that the preferences of policymakers important independent influences on their decisions about environmental policy. This approach is similar to the political pressures approach in assuming the importance of political determinants of policy decisions. On the other hand, where the political pressures approach seeks to explain policy decisions by focusing on the political environment of government decisionmakers, the political elites approach locates explanation in the political attitudes of the decisionmakers themselves. (Hays, Esler, and Hays 1996, 48-49).

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Weber and Shaffer (1972, 694) concluded that "the general public is not always a major determinant of policy." Page and Shapiro (1983: 176) also stated that "political responsiveness might be greatest concerning highly salient issues for which the scope of conflict is broad." The saliency of an issue may change from time to time or from state to state. For example, saliency of solid waste disposal is high in the Northeast –especially New York and New Jersey- but is low in South and Rocky Mountains. Page and Shapiro (1983, 176) noted that "there might also be significant variations across political systems and historical trends, or among different political institutions."

The roles of interest groups vary from issue to issue. In solid waste, not only the pressures of special interest groups (environmentalist and recycling advocates) but also their activities are important. In the case of siting disposal facilities, not the more organized wealthy environmentalist groups, but less organized local groups play crucial roles. In summary, each policy issue has its own pattern.

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# CHAPTER VIII

# RECYCLING COMMITMENT MODEL

Recycling has been one of the most popular strategies for dealing with common solid waste disposal issues. Most solid waste scholars have believed that recycling, composting, and source reduction are appealing as alternative methods to land-based solid waste disposal. These disposal methods may help in alleviating issues of land-based solid waste disposal. Recycling and composting may: (1) save dwindling landfill capacity and virgin materials, (2) create environmentalist culture, (3) reduce negative health impacts of other waste disposal methods (incineration and landfilling), (4) protect environment and (5) create new jobs, and (6) save energy (Ackerman 1997; Blumberg and Gottlieb 1989; Folz 1995, 299). Residential recycling may decrease disposal costs and public opposition associated with landfills and resource recovery plants (Everett 1989). In general, recycling is mainly considered a solid waste disposal method, not a different type of waste collection. Folz (1995, 301) noted that "recycling becomes an important strategy for managing solid waste rather than just an add-on to a conventional waste hauling system."

Despite advantages and positive externalities, recycling is not free of barriers or some side effects. The premier challenge for local and state officials for recycling is constraints of recycling. The major obstacles to recycling, composting, and source reduction are: (1) relatively higher costs, (2) weak incentives and regulations, (3) lack of available resources and market, (4) contamination of collected recyclable and compostable materials, and (5)



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competition with other disposal methods. These and other obstacles are briefly discussed in this chapter.

From the standpoint of this study, the most important advantage of recycling, composting, and source reduction is to save dwindling landfill capacity. All these can be included in the avoided cost calculation of disposing waste in the landfills. Avoided cost is closely tied to dwindling capacity. True land-based disposal cost is rarely included in policy decisions. When landfilling seems cheaper misleadingly due to uncalculated societal, environmental, and other costs, it is possible that a less economically and environmentally sound disposal method may be unnecessarily supported.

## Historical Development of Recycling

Widespread recycling has been implemented during several different periods in the United States. During the first quarter of the twentieth century, recycling was an entrepreneurial activity for newly arrived immigrants. Before the 1920s, 70 % of the nation's cities ran programs to select recyclable materials. During the World Wars material scarcity prompted recycling for the war effort. During the 1940s about 25 % of the waste stream was recycled and reused. During the environmental movement between 1968 and 1978, recycling was seen as the way to conserve energy and improve the natural environment (Everett 1989; Melosi 1981). Spurred by concerns for the environment, the country's recycling and composting rate rose from 7 % in 1960 to 17 % in 1990 (USEPA 1996). The 1990 State of Garbage survey by *Biocycle* (Glenn 1990), which had data for 1989, reported that the recycling rate was 8 % and the landfilling rate was 84 %. The most recent State of Garbage in America survey shows a 28 % recycling rate and a 62 % landfilling rate for 1996. There were 600 recycling programs,

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most of which took place in New Jersey and Pennsylvania in 1988. The number of recycling programs has increased to 6,600 in 1995.

Many states have developed their own recycling programs, legislation, and policies to divert materials from landfills, which remains a top priority in many parts of the country. As a result of recycling and other programs, the contribution of alternative disposal methods has been increasing, whereas the role of landfilling has been decreasing since the early 1980s. Landfilling of municipal solid wastes declined to 67 % in 1994 from a high 84 % in 1990 (Steuteville 1995).

**Demand Side Approaches to Recycling: Recycling Markets**

Recycling consists of collecting secondary materials, preparing those materials for market, and manufacturing new products from recyclables (Office of Technology Assessment 1992, 135). Despite the fact that collecting and processing recyclable materials have been becoming more popular, there has been considerable debate over the economic feasibility of further recycling and the development of markets for recyclable products (Murphy 1993, 36). The major reason for this is lack of a reliable market for most of the recyclable materials probably with the exception of aluminum cans. The price for collected recyclables changes sharply and frequently due to unstable market conditions especially for paper and paper products. The market is getting larger and more reliable with the opening of new facilities that use recyclables.

Markets for both primary and secondary materials are volatile. Volatility of the recycling market seems basically economic, but there are also other barriers to recycling markets. Marketing barriers identified by previous studies can be classified as economic, technical,

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and cultural (Guerra 1992; Selke 1990). Economic barriers include the competition between recycled (secondary) and primary materials and volatility of price for recycled materials. The high capital investments to build new facilities and purchase equipment for recycling industries also constitute economic barriers to recycling. Technical barriers include limited or inconsistent supply or quality of recycled materials, and a lack of technology or inadequate manufacturing facilities to reprocess recycled materials. Cultural barriers include low demand from consumers based on public skepticism of the inferior quality of recycled products or low public participation of residents in recycling programs.

There have been many legislative options designed to encourage demand of recycling and to alleviate economic and technical barriers for recyclable materials. These options include minimum recycled content mandates, utilization rates, recycled product procurement policies, recycled product labeling laws, sales and tax exemption laws, tax credits, and loan and grant programs. The legislation on recyclables can be divided between "command-and-control legislation, which requires a certain set of prescribed actions, or legislation that provides economic incentives for certain behaviors" (McClain 1995, 236). Financial incentives are expected to overcome economic and technical barriers. Recycling education by the government is recognized as a tool to overcome cultural barriers.

## Demand Side Legislation

Minimum recycled content mandates require that a certain percentage of products be made from recycled materials. There are two sources of recovered materials used in products with recycled content. First, post-consumer materials are generated from residential and

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commercial wastes. Second, pre-consumer materials are generated from industry processes such as broken glass from a manufacturing process and never reach the consumer.

Minimum content legislation may guarantee markets for recyclable materials and assure a steady demand for collected recyclable materials for financial companies. Content mandates may artificially increase recycled product prices and impose burdensome reporting requirements on industry. Content mandates also may help to divert secondary materials from their most cost-efficient use to pre-assigned uses. States adopt minimum content mandates on different products. For example, California adopted recycled content mandates for glass and plastic containers, and fiberglass. Connecticut and Maryland have mandates for telephone books. Oregon and Wisconsin have mandates for glass and plastic containers (Murphy 1993, 44).

Procurement policies can stimulate demand for recycled products. Purchases of goods and services by federal, state, and local governments combined represent approximately 20% of the GNP (7-8% federal and 12-13% state and local). By purchasing durable, reusable, recycled, and recyclable products, government can use its purchasing power to support industries and businesses manufacturing and selling recycled materials. Typical procurement policies require the purchasing of a specified percentage of recycled products and allow government agencies to pay more for products containing recycled materials. In 1991, 16 states set aside a portion of their procurement budget to purchase recycled products, and 27 states allowed government offices to pay more for recycled products than comparable products made from primary material.

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As of January 1996, 29 states had at least one form of tax credits to support recycling. Most tax credits targeted at recycling equipment, few of them target property, materials or facilities (Raymond Communications 1996). Existence of tax credits for recyclable materials may increase recycling and decrease landfilling. At least 27 states have tax credit policies to encourage the production of recycled products. Most states provide tax credits for purchase of equipment or facilities used for processing recyclable materials or producing recycled products (McClain 1995, 237).

Paper and paperboard is the dominant material in municipal solid waste. It is estimated that in the year 2000, paper and paper products will comprise 40.5 % of municipal solid waste generation. Non-durable paper products are projected to grow at rates higher than population growth. Strong growth rates are projected for commercial use of paper products. The recycling of these paper products is relatively high. Creating markets for these products can be achieved through newsprint mandates, procurement policies and other methods.

A minimum content of recycled fiber in newspapers is required in at least 11 states (Arizona, California, Connecticut, Illinois, Maryland, Missouri, North Carolina, Oregon, Rhode Island, Texas, and Wisconsin). Florida placed a tax on newsprint. If newspaper publishers use 40 % recycled content paper, they receive a tax credit, or they use paper with less than 40 % recycled content and pay a tax. Newspaper publishers in at least 12 other states (Indiana, Iowa, Louisiana, Maine, Massachusetts, Michigan, New Hampshire, New York, Ohio, Pennsylvania, Vermont and Virginia) have reached voluntary agreements with the state (Murphy 1993, 44).

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## Discussion of Demand Side Recycling Legislation

Many communities and states are assessing whether sufficient recycling markets exist or can be developed in their area. The proximity of manufacturers using recyclable materials is considered to be an important factor for recycling markets. For example, "Denver is approximately 800 miles from the nearest paper mill recyclable feedstock capacity and thus faces substantial transportation costs. International markets for recyclables also unevenly affects regions" (McClain 1995, 235). For successful recycling programs, markets must be found for recyclables and recycled products. For many years, consumers resisted purchasing recycled products, perceiving them as inferior or used.

Currently, industrial use of recycled materials has been limited because of economic barriers. These barriers include inadequate recycling capacity, low consumer demand, and certain federal policies that favor the use of primary materials. To overcome these disincentives and promote recycling, federal, state and local governments can develop legislation that supports recycling and creates economic incentives to use more recovered materials. Another economic barrier to recycled products is their price. Many recycled products are generally more expensive than their primary substitutes. The higher prices partially result from the added separation, collection, processing, and transportation costs. Educating people and applying appropriate techniques to reduce contamination of collected recyclables may substantially reduce final product price and increase quality.

Franke (1992) suggested that national or statewide standards and regulations may be inappropriate at the local level because of the highly regional nature of the market for recyclable materials. For example, Connecticut has found glass and aluminum recycling

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successful but not newspaper recycling, which is one of the most profitable resources in Oregon. Standards and regulations for recycling seem to change from community to community and a recycling market development may include: (1) buying recycled, (2) education and outreach, (3) research and development, (4) financial assistance, and (5) technical assistance (Ohlsen 1996).

### Supply Side Approaches to Recycling: Collection Programs

At the present, most local and state governments focus on newsprint, cardboard, glass, aluminum, tin cans, and plastic recycling. Recycling and reuse of paper accounted for nearly half of the municipal solid waste according to a report by Franklin Associates - a USEPA contractor for a biennial solid waste reports (USEPA 1996). Volume and amount of paper products, organic materials, including yard waste, plastics and glass are high. Diverting a significant portion of these items may result in the decline of land-based disposals.

Legislative tools to increase the supply of quality recyclable materials include mandatory recycling collection laws, container deposit laws, and bans. Thirty-five states have adopted some form of mandatory recycling. Under this legislation a state or county sets recycling goals for targeted materials and timetables to achieve the goals. Often the avoided disposal fees and revenues from the sale of recyclable materials do not offset the implementation and operational costs of a community recycling program. As a result, recycling programs are often supported by state or local sources (Rogoff and Williams 1995).

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## Taxes, Fees, and Surcharges

Despite the fact that subsidies can be used to encourage source reduction, taxes can act as a disincentive for practices that create high environmental costs. Taxes can discourage the use of certain products, such as seldom-recycled products or packaging. An advance disposal fee (ADF) is one type of tax that can be levied by states. This non-refundable fee can be levied on the manufacturer, wholesaler, retailer, or consumer of a product. Revenues generated from the fee are used to subsidize or offset recycling or disposal costs of the taxed product. Variable fees on garbage and recyclables are common. Individuals pay a certain fee on garbage disposal, usually by volume, and no fee or a lower fee on recyclables. Bonini (1993) maintains that unit-based pricing for residential garbage collection with a subsidized free recycling collection program is the most important economic incentive to expand and strengthen recycling.

## Recycling Mandate

Many states passed recycling legislation starting in the late 1980s. With respect to source separation, these laws vary from the strictest form of mandating curbside programs, to requiring that recycling be addressed in planning, to providing financial incentives for those communities that are willing to initiate programs. Rhode Island is the nation's first state to pass a mandatory recycling law for aluminum cans, glass, plastic, and newspaper.

Curbside recycling programs raise the question of whether a program should be mandatory or voluntary to increase recycling. One of the reasons for mandatory recycling is to lessen landfill crisis emerging as landfill capacity declines and environmental/health problems of land-based disposal. States may require local governments to establish recycling

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collection programs. For example, New Jersey has required all 567 municipalities in the state to adopt mandatory recycling ordinances since 1989. Recycling mandates and similar other aggressive policies, together with severe pollution and lack of disposal facilities in New Jersey, have resulted in the highest recycling rate in the United States.

Everett (1989) demonstrated that mandatory recycling regulations increased recycling and decreased landfilling. Mandatory recycling laws are accepted in the states with severe landfill disposal problems and higher tipping fees. In 1989, 26 states had laws requiring recycling to be an integral part of waste management. Oregon, New Jersey, and Pennsylvania are the pioneers for mandatory curbside collection programs. These 3 states have high recycling and relatively low landfilling rates. Both Pennsylvania and Oregon require all municipalities over 4,000 in population to provide collection of source separated materials. In Oregon, curbside collection programs must be provided at least monthly to all residences.

## Mandatory Deposit Laws (Bottle Bills)

Bottle bills or container deposit legislation can increase the supply of recyclables. Deposit legislation was enacted to prevent littering, but it has also proven an effective method for collecting source-separated materials. Both opponents and proponents of deposit laws agree that the main goal of deposit laws is to prevent litter in roads, streets, parks, and so on. Mandatory deposit laws may help to reduce dependence on landfills.

Bottle bills have boosted the markets for post-consumer glass, aluminum, and plastic recyclables although they only target 4 % of the waste stream. States considering bottle bill legislation still encounter strong opposition from bottle and beverage industries because of

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the shift of collection costs from local government to industry and consumers despite the fact that bottle bill states experience high collection rates.

### Landfill and Incinerator Disposal Bans

Another method to increase the supply of recyclable materials is a disposal ban. Bans are controversial policy approaches. While disposal bans may be limited in their effectiveness to divert waste from disposal, they often prompt product manufacturers to invest in solid waste management, especially in recycling. In the case of disposal bans, illegal dumping is an important consideration. Without comprehensive recycling programs and adequate recycling markets, banning may increase illegal dumping. Low cost backyard composting, education, encouraging reuse and recycling may increase the success of disposal bans.

Proponents of landfill disposal bans believe that bans accomplish several goals. The first goal is to reduce the volume of the banned material landfilled or incinerated. The second goal of the disposal ban is to prompt industry to change manufacturing practices. Disposal bans also contribute to increased public awareness and help directly address environmental and public health concerns. Opponents argue that some bans simply force substitution of one material for another and do not increase the demand for recyclable or compostable materials (Murphy 1993, 17).

## Composting Programs and Policies

Yard waste programs constitute the majority of composting operations in the United States. For instance, yard wastes constitute almost one-fifth to one-sixth of the municipal solid waste stream by weight; yard and food wastes combined account for about one-quarter

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of the total. Altogether, non-recyclable, compostable organic materials (yard and food wastes, soiled or non-recyclable paper, and other compostable materials) make up about 35% of the waste stream (USEPA 1996).

Early composting facilities failed because they could not compete economically with landfilling. Today, many communities combine curbside leaf/yard waste collections or drop-off sites with public education campaigns to promote home composting. Some states have banned yard wastes from landfills, prompting communities to establish composting programs. One of the advantages of backyard composting is that residents set out less waste at the curb and take care of processing the portion they have diverted. Residents benefit by producing a useful and high quality garden product. In communities that charge per can for garbage collection, backyard composters are likely to save money as well. Despite the fact that composting has been considered an integral part of a comprehensive approach to municipal solid waste management, it has been emphasized that benefits accrue only when organics are source-separated (Murphy 1993, 63).

Composting refers to the biological process by which organic material, such as yard wastes, food wastes, and paper, is broken down by microorganisms in the presence of oxygen to form compost. Controlling key physical and chemical factors can facilitate the process and avert odors, and other problems in composting. Moisture, oxygen, available nutrients, temperature, and particle size all influence microbial activity and thus the composting rate.

## Market for Compostable Materials

Because compost is a product, waste management officials and planners must consider potential end markets in the planning stages when they determine the appropriate scale

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and degree of sophistication of a composting operation. At the present time, there seems to be no federal standards for regulating compost. Few states implement different minimum quality standards depending upon the end use of the compost. The state of New York, for example, requires that compost for residential use be of higher quality than compost used for land reclamation projects. Chiefly the level of chemical contaminants, especially heavy metals, determines compost quality. Physical contaminants, such as plastic and glass, also may decrease the value and quality of composting product (Murphy 1993, 66).

### Number of Composting Programs

There were about 1,400 composting programs in the United States as of 1989, but 500 of them compost only leaves on a seasonal basis. This number jumped to 3,300 in 1995 according to USEPA. More than half of these programs are in the Northeast region. Because yard waste constitutes nearly 21 % of the total municipal solid waste generated, substantial increases in the amount of composting facilities are expected in the near future.

Nearly 10 to 15 % of the municipal solid waste stream consists of other compostable organic materials. Few composting facilities also compost organic in substantial amounts. The recycling/composting rate of yard wastes was at around 12 % in 1990. States can reduce landfilling by promoting composting as long as adequate compost market is available.

## Pros and Cons of Recycling and Composting: Do They Offer Some Relieve to Reduce Land-Based Solid Waste Disposal?

The debate on the economic viability of recycling has been continued. Benefits from recycling include the value of recovered materials, savings of disposal costs (landfill tipping fees), savings of landfill space, protecting nature and primary materials, and energy savings.

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De Young (1986) believes that recycling presents a tangible and intrinsically satisfying way to participate in solving an environmental problem to which everyone contributes. Therefore, for the growing proportion of citizens concerned about the quality of the local environment, recycling offers remarkable opportunities.

Opponents of recycling claim that supply of recyclable materials exceeds the demand. Proponents argue that the economic equation must include the long-term environmental, resource conservation, and energy benefits. The formula for evaluating recycling should include the avoided costs of disposal – saving landfill space and operating less incinerators. Not all the benefits of recycling are currently captured in market transactions; therefore, advocates support legislative action to stimulate demand for recovered materials.

Both sides do agree on two issues: (1) Garbage fees should reflect the full costs of waste management. (2) Consumers should be charged for what they throw out, either in volume- or weight-based collection rates. Despite the recycling success stories and statistics showing the savings in resource extraction and production costs from recycling municipal solid waste, the feasibility of a local recycling program should be evaluated on a case-by-case basis.

> Composting organic material and including more types of materials in the recycling program divert a significantly larger proportion of solid waste from disposal. In addition, determining which materials to target for recycling is a complex task, one that requires a through analysis of the market for the product. There are regional variations in price, supply, and demand for different materials. These factors must be investigated to assure that recyclable materials do not wind up being disposed in the local landfill anyway. Once these decisions about target materials are made, however, it is important to establish a specific goal for recycling some proportion of the waste stream. (Folz 1991, 231)

A comprehensive analysis comparing various alternative disposal methods and their various degree of combination from cost, environmental issues, landfill space saving made

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by SRI International (1992) for *National Renewable Energy Laboratory, Colorado* shows that composting municipal solid waste may reduce the volume of landfilled material significantly.

Every ton of material recycled means that one less ton is disposed in a landfill or incinerator. Recycling and composting divert materials from the waste stream that otherwise must be collected and disposed. The potential costs include a reduction in the number of times garbage trucks are driven to and unloaded at a disposal facility, a possible increase in the efficiency of collection routes, and a possible reduction in equipment and maintenance costs. The avoided costs should include landfill life extension and postponing the need to acquire, develop, and operate a facility in compliance with more stringent environmental standards (Folz 1995). In creating recycling programs, all type of costs, markets, demographic, geographic, and financial conditions should be considered.

## Theoretical Construct: Recycling Commitment

Everett (1989) hypothesized that "the implementation and strength of a statewide or local recycling program is related to the state's municipal solid waste disposal situation (severity), and the anticipated market conditions for recyclable materials in the state." Government and industry must work together to address the market situation. It is critical to make sure that mandated recycling programs do not get too far ahead of the markets. Even with a good market situation, recycling and composting will flourish only if they are made convenient. Recycling will flourish where economic conditions support it, not just because it is mandated.

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## An Indicator of Recycling Market: Number of Paper Mills

Paper and paper products account for 39 % of municipal solid waste in the United States. Paper and paper products have received more market development attention from governments than any other materials (Young, 1995). USEPA (1995) estimated that the amount of paper recovered from municipal waste stream grew from 13 million tons in 1985 to 26 million tons in 1993. During much of this period, wastepaper prices lagged, as the amount collected grew faster than the overall capacity of paper recycling plants. This amount of over-collected paper, because of no market or not enough paper mill capacity, caused recycling problems. Due to increased recyclable paper capacity, in 1994, recycling mills were scrambling for used paper supplies. Because of this sudden shortage of recyclable materials in 1994, market prices in some places jumped 200 %. Despite some regional or seasonal problems of paper market and recyclable paper price, paper accounted for most of the tonnage collected in recycling programs and played the biggest role in improved recycling economics (Steuteville 1994a, 30-32).

Market availability for recyclables is a regional issue. In the Northwest, communities have not had a problem recycling old newspapers because of the large number of newsprint mills able to use old newspaper and their shipping proximity to paper markets in the Far East. Other regions, those not close to wood pulp sources, have experienced large market fluctuations for old newspapers. Similarly, some Midwestern paper mills run primarily on scarp paper. A North Carolina plastic recycling plant has been able to take soda bottles from all over the South. Steel-belt cities can dispose of metal even in depressed markets, given their proximity to manufacturers.

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It should be remembered that it takes time before there is sufficient dispersion of secondary markets to provide consistent, regionally available service. Many states have begun to examine the issue of market development, recognizing that recycling mandates will be very empty without the users for waste materials. Therefore, as an indicator of adequate market for recyclables, the number of paper mills ranked by states is used.

This variable may be misleading because it considers the number of mills but not their capacity. For example, as of 1995, New York State was home to the largest number of paper mills (54) in the United States. However, most of New York's mills are smaller, older and nonintegrated in comparison with newer mills built during the last 10 years in other regions. This situation places New York's mills at a competitive disadvantage, especially when competing in commodity markets (Coburn and Garrett 1995). The number of paper mills ranked by states also does not consider the aggressiveness or proportions of using recycled paper fiber versus primary fiber for paper production. For example, New York's paper companies are responding to their non-competitive situation by using aggressively more post-consumer fiber to take advantage of a growing market demand and to reduce mill fiber costs. In fact, while processing pulp from primary sources is declining in New York, recycling capacity has grown to include 30 of the 54 mills (Coburn and Garrett 1995).

### Percent of People Served by Curbside Recycling Programs

There has been phenomenal growth in the number of curbside recycling programs operating in the United States. At the end of 1988, there were just under 1,000 such programs. The number of curbside programs rose to 5,386 in 1992; and they exceeded the number of landfills (5,045).

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Most of the recycling programs (40 %) of the 7,375 in 1995 were in the Midwest. The Northeast region however had the largest population (37 million persons) served by recycling programs. Approximately 47 % of the population, or 121 million persons, had access to curbside recyclables collection. In the Northeast 72 % of the population have access to curbside recyclables collection, while in the South only 34 % of the population have access to curbside recycling (USEPA 1996, 104).

Comprehensive recycling is seen as a more successful strategy in diverting more waste from landfills. In general a comprehensive recycling program is more applicable in larger urbanized areas where adequate market is available for all the materials collected. Comprehensive recycling programs require collection of all or most of the recyclable materials, ranging from paper to plastic and glass. It is hypothesized that percent of people served by curbside recycling programs will be negatively related with landfilling rate.

## Population Density

Densely populated, urbanized communities may have higher recycling rates than sparsely populated, rural communities. Statistics shown that densely populated urbanized counties have higher per capita waste generation because they have a high level of economic activity (Rathje and Murphy 1992). Per capita waste generation may have a positive effect on the recycling rate (Yoon 1994, 40). Curbside recycling programs that contribute to recycling rates are more viable in urban areas. Additionally, states that have a large population and density are more likely to have more environmental problems associated with the solid waste disposal due to higher waste generation and the shortage of landfill space. As a result, they

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are more likely to place a high priority on recycling programs (Ladd and Laska 1991) and reducing landfilling.

## Yard Waste Landfill Disposal Bans

Landfill bans are seen as a viable option for solid waste management. Wisconsin's sweeping bans of all types of packaging and paper went into effect in 1995. This law includes all corrugated office papers, some plastic, steel, aluminum, paper, and glass containers. Unless a city has already been recycling 25 % by volume of its waste, certain actions should be taken. According to Raymond Communications (1996, 11), the landfill bans have been effective in increasing recycling in Wisconsin, Massachusetts, and other states.

At least 44 states as of 1992 (the number is probably higher now) have some type of disposal ban in place. By the end of 1992, 22 states had adopted bans on the disposal of leaves, brush, grass clippings, and other yard trimmings in landfills. One of the ways to reduce the amount and toxicity of solid waste is to ban specific items from the solid waste stream. Banning may also reduce the cost of solid waste management by saving additional landfill space, and reducing toxic materials, which may cause expensive treatment if they are deposited in municipal solid waste landfills. Because this study is focused on landfilling rate not on toxicity, only the yard waste ban is examined in detail and other waste bans are excluded in the statistical analysis. The yard waste ban is hypothesized to be negatively related with landfilling rate (USEPA 1996).

Banning yard waste may reduce waste disposal significantly because around 20 % of the municipal solid waste stream consists of yard waste, which includes tree trimmings, grass clippings, leaves, and others (USEPA 1994 and 1996). Yard waste, food waste, and some

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wood products are compostable. Banning yard waste and encouraging composting may help to create usable products from these items like mulch. Home composting and mulching mowers are becoming more popular, but their effect is hard to measure. Further study is needed to determine the quantity of yard trimmings that remain in the municipal solid waste stream after disposal bans and diversion programs are put in place (Steuteville 1994b, 52).

Other currently banned items do not significantly related to state landfilling rate. For example, household hazardous waste ban, battery ban, and used oil ban are crucial in reducing toxicity but their total amount in waste stream is insignificant. These other bans may significantly reduce groundwater contamination, and other negative side effects of landfills or incinerators. Disposal bans may result not only in the reduction of per capita solid waste disposal but also in securing additional disposal capacity. One of the major goals of states in solid waste management is to reduce the environmental and health hazards of waste disposal. Proportion of yard waste in the solid waste stream changes from community to community.

There is evidence that where communities have charged separately for pickup of yard trimmings, or where disposal of yard trimmings in landfills has been banned, or other regulatory and educational measures have been taken, the amount of yard trimmings entering the system has greatly declined (USEPA 1996, 124). In other words, source reduction at the site of generation has been accomplished through backyard composting and grasscycling.

Food wastes and yard trimmings combined made up 21 % of the municipal solid waste generation in 1995, so source reduction measures aimed at these products can have an important effect on waste generation and disposal. Composting is the usual method for recovering these organic materials. There is a trend toward leaving grass clippings on lawns,

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sometimes through the use of mulching mowers. Part of the impetus for source reduction of yard trimmings is the large number of state regulations discouraging landfilling. By 1997, nearly half of the states were to have in effect legislation affecting disposal of yard trimmings. USEPA staffs believe that when bans stay in effect a couple years, people find ways to source reduce.

## Region as an Indicator of Recycling Market

A national survey reveals that the biggest problem of recycling programs is finding markets for recyclables (Folz 1991). Recycling is a market-based activity, and its success depends on securing markets for the purchase of recycled products (Guerra 1992; Steuteville 1992). States closer to national and foreign markets for recyclable materials have a higher percentage of recycling. Many recyclable materials, especially paper and paper products, are now exported to Southeast Asia because U.S. paper mills and their capacity for recyclable paper and paper products are limited. Therefore, West Coast states (Washington, Oregon, and California) have higher recycling rates because of proximity for final markets of paper recyclables. Paper and paper products consist of more than one-third of the whole municipal solid waste stream. So, a higher recycling in West Coast states is expected because of market availability.

Because there is no direct measurement of markets for recyclables, region may be used as an indirect measure of market. Region is not used in statistical analysis in this study because of its nominal nature. A regional pattern of solid waste disposal practices can be observed. For example, recycling is higher in the Northeast and Great Lakes area. Landfilling is the major disposal practice in the South, with the exception of Florida and Arkansas. All

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the Rocky Mountain states, but South Dakota, have high landfilling and very low recycling rates. Incineration is not a favorable alternative in the South and Rocky Mountain states.

All 50 states have various recycling programs. Curbside recycling collection is a common practice among larger U.S. municipalities. Curbside recycling programs, collection systems, and materials collected vary from region to region or from city to city. Municipalities are more cautious not to collect materials that have no market value in their region. Sharp decline of the price for recyclable paper during the early 1990s taught to municipalities to consider regional markets.

## Summary Chapter Conclusion

In this chapter, recycling barriers and contributions of recycling to solid waste disposal are discussed. At the beginning of chapter, both demand and supply side of recycling ware discussed and various state strategies to increase recycling are summarized. After that composting is discussed. The third section of the chapter is devoted to highlight the pro and con sides of recycling and composting as methods to reduce dependence on landfills. Indicators of the recycling commitment model are introduced in the last section of the chapter. Recycling commitment is hypothesized to be negatively related to landfilling rate.

From chapter 4 to chapter 8, models, indicators, and theoretical background for determinants of state landfilling rate are introduced. Literature from political science and environmental studies is reviewed and related to landfilling rate. Indicators to determine state landfilling rate (dependent variable) are discussed from chapter 5 to chapter 8 but measurement of each indicator are given at the beginning of next chapter. Statistical analysis findings are also reported in the next chapter.

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# CHAPTER IX

# DATA SOURCES, METHODS, AND RESEARCH RESULTS

First, data sources, and measurement of each independent variable are presented briefly. Second, statistical analysis methods are discussed. Findings of statistical analysis on state landfilling rate are reported. Summary statistics tables are integrated to the measurement of independent variables. Correlation matrix, and multiple regression analysis tables are presented with findings.

## Data Sources and Measurement

Data used in this study are based on secondary sources. Annual nationwide survey data regarding solid waste disposal are published in *Biocycle* starting in 1989. The 1996 data was published in April and May 1997 issues of *Biocycle*. Parts of this data set have been used or re-reported in many studies. This comprehensive survey data includes various regulations, solid waste generation, distribution of the solid waste disposal among the alternatives, curbside collection programs, composting programs, and landfill and incineration tipping fees.

In table 3, independent variables are listed according to the model. Variables tested in statistical analysis are grouped based on models discussed in chapter 5 to chapter 8. Among the alternative measurement of the same concepts, some of them removed after preliminary analysis and literature review.



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## Table 3. List of Independent Variables

### Issue Severity Model

| | |
|---|---|
| Tipping Fees | Landfill tipping fees |
| Metro Population | Percentage of metro population |
| Landfill Capacity | Remaining years of landfill capacity (dummy) |
| MSW Generation | Per capita municipal solid waste generation |

### State Institutional Capacity Model: Economic Strength

| | |
|---|---|
| Spending | Per ton state spending to manage solid and hazardous wastes |
| Income | State per capita income |
| Product | Percent change of per capita gross product: 1981-91 |

### State Institutional Capacity Model: Legislative, Innovative, and Administrative Strength

| | |
|---|---|
| Capacity | General institutional capacity (dummy) |
| Innovation | Environmental initiatives and innovation score |
| Centralization | Administrative Centralization (category) |
| Employment | Number of full-time equivalent solid waste management employees |
| Professionalism | Legislative professionalism index |

### Public Opinion and Liberalism Model

| | |
|---|---|
| Liberalism | Standardized index of composite policy liberalism |
| LCV Score | LCV Score on Environment (Both Houses) |

### Recycling Commitment Model

| | |
|---|---|
| Paper Mills | Number of paper mills ranked by states |
| Recycling Commitment | RENEW America recycling commitment score |
| Population Density | State population density |
| Yard Waste Ban | Yard waste disposal ban (dummy) |
| Curbside Programs | Percent of people served by curbside programs |

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## Measurement of Dependent Variable (Percent Municipal Solid Waste Landfilled or Landfilled Rate)

The source of dependent variable is the journal of *Biocycle*. The April and May 1997 issues of Biocycle provide data about state municipal solid waste management, including landfilling rate. Percentage of municipal solid waste landfilled (landfilling rate) is presented in table 4. The dependent variable has a possible range of 0 to 100. Connecticut has a municipal solid waste landfilling rate of the lowest (17%), followed by Massachusetts (22%), Minnesota (25%), and Maine (28%). Wyoming's ratio of landfilling is the highest (96%), followed by Montana (92%), Idaho (90%), and Kansas (89%).

Table 4 clearly shows that, with the exception of Arkansas and Florida, landfilling rates are high in all of the Southern states. Similarly, with the exception of South Dakota, landfilling rate is very high in the Rocky Mountain region. Table 4 also shows that most of the Northeastern, Great Lakes, and West Coast states have low landfilling rates.

**Table 4. State Solid Waste Landfilling Rate**

| Alphabetical Order | | | Lowest to Highest | | |
|---|---|---|---|---|---|
| Alabama | AL | 75 | Connecticut | CT | 17 |
| Alaska | AK | 78 | Massachusetts | MA | 22 |
| Arizona | AZ | 86 | Minnesota | MN | 25 |
| Arkansas | AR | 63 | Maine | ME | 28 |
| California | CA | 72 | New Jersey | NJ | 34 |
| Colorado | CO | 83 | Florida | FL | 38 |
| Connecticut | CT | 17 | Vermont | VT | 40 |
| Delaware | DE | 56 | Virginia | VA | 47 |
| Florida | FL | 38 | Hawaii | HI | 49 |
| Georgia | GA | 66 | New Hampshire | NH | 50 |
| Hawaii | HI | 49 | New York | NY | 52 |
| Idaho | ID | 90 | Maryland | MD | 54 |
| Illinois | IL | 76 | Washington | WA | 55 |
| Indiana | IN | 69 | Delaware | DE | 56 |
| Iowa | IA | 70 | Wisconsin | WI | 56 |
| Kansas | KS | 89 | Tennessee | TN | 59 |
| Kentucky | KY | 82 | Oregon | OR | 60 |

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**Table 4. State Solid Waste Landfilling Rate -- *Continued***

| | | | | | |
|---|---|---|---|---|---|
| Louisiana | LA | 85 | S. Dakota | SD | 62 |
| Maine | ME | 28 | Arkansas | AR | 63 |
| Maryland | MD | 54 | Michigan | MI | 65 |
| Massachusetts | MA | 22 | Georgia | GA | 66 |
| Michigan | MI | 65 | Pennsylvania | PA | 66 |
| Minnesota | MN | 25 | Indiana | IN | 69 |
| Mississippi | MS | 85 | Iowa | IA | 70 |
| Missouri | MO | 74 | S. Carolina | SC | 71 |
| Montana | MT | 93 | California | CA | 72 |
| Nebraska | NE | 74 | N. Dakota | ND | 73 |
| Nevada | NV | 88 | Utah | UT | 73 |
| New Hampshire | NH | 50 | Missouri | MO | 74 |
| New Jersey | NJ | 34 | Nebraska | NE | 74 |
| New Mexico | NM | 88 | Alabama | AL | 75 |
| New York | NY | 52 | Illinois | IL | 76 |
| N. Carolina | NC | 76 | N. Carolina | NC | 76 |
| N. Dakota | ND | 73 | Rhode Island | RI | 77 |
| Ohio | OH | 83 | Alaska | AK | 78 |
| Oklahoma | OK | 78 | Oklahoma | OK | 78 |
| Oregon | OR | 60 | Kentucky | KY | 82 |
| Pennsylvania | PA | 66 | Colorado | CO | 83 |
| Rhode Island | RI | 77 | Ohio | OH | 83 |
| S. Carolina | SC | 71 | Louisiana | LA | 85 |
| S. Dakota | SD | 62 | Mississippi | MS | 85 |
| Tennessee | TN | 59 | Texas | TX | 85 |
| Texas | TX | 85 | Arizona | AZ | 86 |
| Utah | UT | 73 | W. Virginia | WV | 87 |
| Vermont | VT | 40 | Nevada | NV | 88 |
| Virginia | VA | 47 | New Mexico | NM | 88 |
| Washington | WA | 55 | Kansas | KS | 89 |
| W. Virginia | WV | 87 | Idaho | ID | 90 |
| Wisconsin | WI | 56 | Montana | MT | 93 |
| Wyoming | WY | 96 | Wyoming | WY | 96 |

Source: Goldstein and Glenn 1997.

## Measurement of Issue Severity Model

It is hypothesized that issue severity to be negatively correlated with landfilling rate. Indicators of the issue severity model are landfill tipping fees, percentage of metro population, remaining years of landfill capacity (dummy variable less than 10 years represented

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with 0 and more than 10 years with 1), and per capita municipal solid waste generation. In previous studies, issue severity model was measured by using indirect variables like urbanization, population density, manufacturing sector's role in a state economy. Quality, availability, and reliability of municipal solid waste disposal data are higher now. In this study, more direct measurement of the solid waste disposal issues such as landfill tipping fees and remaining years of landfill capacity are used.

**Table 5. Issue Severity Model: Summary Statistics**

| *Variables* | *Definition* |
|---|---|
| Tipping Fees | Landfill tipping fees |
| Metro Population | Percentage of metro population |
| Landfill Capacity | Remaining years of landfill capacity (dummy) |
| MSW Generation | Per capita municipal solid waste generation |

| *Variables* | *Mean* | *Std. Deviation* | *Minimum* | *Maximum* |
|---|---|---|---|---|
| Tipping Fees | 35.29 | 17.87 | $7.75 | $80.00 |
| Metro Population | 67.00 | 21.54 | 23.8% | 100.0% |
| Landfill Capacity | 0.42 | 0.50 | 0 (<10 years) | 1 (>10years) |
| MSW Generation | 1.20 | 0.38 | .75 ton | 2.15 ton |

***Landfill Tipping Fees***

The main source of landfill tipping fee is "The State of Garbage in America" survey, authored by Nora Goldstein and Jim Glenn, published in Biocycle April 1997 issue. The missing data was compiled from Environmental Industry Associations' 1996 Update of Municipal Solid Waste Disposal Trends authored by Repa and Blakey. Landfill tipping fees were arranged by states in Biocycle and by 7 regions in 1996 Update. The cost of landfill

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disposal went down to about $32 a ton in 1996 from about $34 ton in 1995 (using a weighted average tipping fee nationwide). The weighted averages on a regional basis are as follows according to Biocycle nationwide survey: Mid-Atlantic ($54), New England ($47), West ($32), South ($31), Midwest ($25), Great Lakes ($22), and Rocky Mountains ($20).

***Remaining Years of Landfill Capacity***

Remaining years of landfill capacity was derived from Repa and Blakey's 1996 Update published by Environmental Industry Associates. Remaining number of years of disposal capacity are shown in 3 categories as less then 5 years, 5 to 10 years, and more than 10 years of capacity. Because more than 10 years of remaining landfill capacity is considered as satisfactorily long, the first two categories were merged and a dummy variable was created. Less than 10 years of remaining years of landfill capacity was coded as 1 and more than 10 years of capacity was coded as zero.

In 1986, 25 states had less than 10 years of remaining landfill capacity and in 1991 29 states had less than 10 years of capacity. Number of states with less than 10 years of capacity had declined to 12 in 1995. In 1995, most states have addressed their disposal capacity needs. Repa and Blakey (1996) expected that additional disposal capacity will probably be added only when existing capacity is depleted on a regional basis. Forty-five states answered no when asked by *Biocycle* in 1996 if in general, there is a disposal capacity problem in their state. Only Hawaii answered "yes", noting that each county in the state is facing a landfill closure and there are issues related to new construction.

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***Per Capita Municipal Solid Waste Generation***

Per capita municipal solid waste generation is calculated from Goldstein and Glenn's *Biocycle* Nationwide Survey in 1996. This survey provided total tons of municipal solid waste generation. That number is divided to 1996 population of the state. Per capita generation of municipal solid waste generally excludes sewage, demolition and industrial waste.

***Percent Metro Population***

Percent metro population is derived from Bureau of Census' Statistical Abstract of the United States. This data is belong to July 1 1994. New Jersey has the highest metro population (100 %), and Montana has the lowest (23.8%).

## Measurement of State Institutional Capacity Model: Economic Strength

It is hypothesized that economic strength to be negatively related to landfilling rate. Per ton state spending measures state spending on wastes. Percentage change in per capita gross product refers to growth in economy.

**Table 6. State Institutional Capacity Model; Economic Strength: Summary Statistics**

| *Variables* | *Definition* |
|---|---|
| Spending | Per ton state spending to manage solid and hazardous wastes |
| Income | Per capita income |
| Product | Percent change in per capita gross product: 1981-91 |

| *Variables* | *Mean* | *Std. Deviation* | *Minimum* | *Maximum* |
|---|---|---|---|---|
| Spending | 2.38 | 2.60 | $.08 | $10.70 |
| Income | 19,923 | 2873.26 | $15,984 | $27,951 |
| Product | 71.80 | 25.90 | 4.52% | 128.89% |

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***Percent Change in Per Capita Gross Product (1981-1991)***

Percent change in per capita gross state product (1981 to 1991) is derived from State Rankings 1995. The national average of percent change is 73.27% increase. The highest increase was achieved by Delaware (128.89%), New Jersey (105.25%), Connecticut (104.39%), and New Hampshire (102.86%). The lowest per capita gross state product increase was by Wyoming (4.52%), Alaska (14.22%), Oklahoma (24.01%), and North Dakota (24.04%).

***Per Capita Income***

Per capita income data are gathered from State Rankings (Morgan Quitno Corporation 1995). The Bureau of Economic Analysis (United States, Department of Commerce) provides the main source of these data in *Survey of Current Business*. In 1993, the highest per capita personal income was in Connecticut ($27,951), New Jersey ($26,800), New York ($24,831), and Massachusetts ($24,451). The lowest per capita personal income was in Mississippi ($14,723), Arkansas ($15,984), Utah ($16,134), and West Virginia ($16,167). National average of per capita personal income was $20,791 in 1993.

***Per Ton State Spending to Manage Solid and Hazardous Waste***

State spending on solid and hazardous waste per ton was taken from *1991-1992 Green Index* compiled by Hall and Knerr (1992). The main source of data is the *Second Edition of Resource Guide to State Environmental Management* published by Council of State Governments. This variable consists of per capita spending in fiscal 1988 to monitor, manage, minimize, and regulate solid and hazardous wastes. It includes state, federal, and

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other funds (fines, licenses, etc.) that pass through state budgetary process. It excludes funds raised and spent by municipal and county governments for garbage or waste management. Maine ($10.70), Montana ($9.77), Delaware ($7.66), and New Hampshire ($6.09) spent the most to manage solid and hazardous wastes. The lowest per ton spending to manage solid and hazardous wastes are seen in Georgia ($0.08), Texas ($0.16), Alabama ($.0.18). and South Carolina ($0.28).

## State Institutional Capacity Model: Legislative Innovative, and Administrative Strength

As explained in chapters 1 and 6, state institutional capacity consists of 4 dimensions in this study. Indicators of economic strength (capacity) dimension are handled separately in this study. The other 3 dimensions –legislative, innovative, and administrative- are grouped and examined together. Number of full-time equivalent of solid waste employees and administrative centralization are indicators of administrative capacity dimension. General institutional capacity includes various dimensions of state institutional capacity.

### *State Environmental Initiatives and Innovations Score*

The earliest state environmental initiatives and innovations score is calculated by Renewable Natural Energy Resources (RENEW). The index calculated using various initiatives for 67 environmental policies taken by states. An improved score was calculated in 1991 by Bob Hall and Marry Lee Knerr covering 67 environmental policy initiatives in the Green Index. The Green Index awarded up to 220 points for state initiatives in 67 environmental policy areas. California ranks first and Arkansas ranked 50th in this score. While even the

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best states lag behind in some environmental policy areas, every states at least has few initiatives to adopt early.

**Table 7. State Institutional Capacity Model; Legislative, Innovative, and Administrative Strength: Summary Statistics**

| *Variables* | *Definition* |
|---|---|
| Capacity | General institutional capacity (dummy) |
| Centralization | Administrative Centralization (category) |
| Innovation | Environmental initiatives and innovation score |
| Employment | Number of full-time equivalent solid waste management employees |
| Professionalism | Legislative professionalism index |

| *Variables* | *Mean* | *Std. Deviation* | *Minimum* | *Maximum* |
|---|---|---|---|---|
| Capacity | 0.46 | 0.50 | 0 (low) | 1 (high) |
| Innovation Score | 44.76 | 14.52 | 23.10 | 77.40 |
| Centralization | 3.42 | 1.27 | 1 (category) | 5 (category) |
| Employment | 3.94 | 2.10 | 0.3 | 10.2 |
| Professionalism | 0.41 | 1.85 | -3.04 | 4.28 |

***General Institutional Capacity***

General institutional capacity, a dummy variable, is presented by Davis and Lester. Davis and Lester's edited book chapter called *"Federalism and Environmental Policy"* published in *Environmental Politics and Policy* edited by James P. Lester (1989). Davis and Lester grouped 25 of the states as high institutional capacity states.

***Administrative Centralization (Bureaucratic Consolidation)***

Administrative centralization is a categorical variable. The coding is: (1) decentralized, (2) partly decentralized, (3) balanced (4) partly decentralized, (5) centralized. This data

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is coming from Cummings (1990). Four states -California, Colorado, Minnesota, and New York- categorized as decentralized. Number of states falls in other categories as follows: partly decentralized (6), balanced (21), partly centralized (3), and centralized (16).

### *Number of Full-time Equivalent of State Solid Waste Management Employees*

Full-time equivalent of state solid waste management employees per 10,000 was derived from the 1989 edition *of State Policy Data Book* published by State Policy Research. States with the highest number of full-time equivalent employees were New York (10.2), Alabama (8.7), Georgia (8.0), North Carolina (7.5) and South Carolina (7.4). States with the lowest number of full-time equivalent employees include Nevada (0.3), Vermont (0.8), Oregon (0.8), Minnesota (1.5), and Missouri (1.6). The national average is 4.5. Within top 10 states with higher employees per 10,000 population, only New York and Florida have low landfilling rates. In contrary, among the lowest 10 states, Vermont, Oregon, and Minnesota have relatively low landfilling rates. There is no clear pattern and relationship between number of solid waste management employees and landfilling rate.

### *Legislative Professionalism Index*

Legislative professionalism was measured differently by political scientists starting with 1971. Bowman and Kearney's 1988 composite legislative professionalism index score is used in the analysis. Calculation of this index is explained in chapter 6.

## Measurement of Public Opinion and the Liberalism Model

Public opinion and liberalism consists of two dimensions. The first dimension is called public opinion or general policy liberalism alternatively. The second dimension is elite

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liberalism measured with the LCV score. In fact the LCV score measures both environmental voting of Congressional representatives and elite opinion on environmental issues.

**Table 8. Public Opinion and Liberalism Model: Summary Statistics**

| *Variables* | *Definition* | | | |
|---|---|---|---|---|
| LCV Score | LCV Score on Environment (Both Houses) | | | |
| Liberalism | Standardized index of composite policy liberalism | | | |
| *Variables* | *Mean* | *Std. Deviation* | *Minimum* | *Maximum* |
| LCV Score | 2.38 | 2.60 | 21.0 | 81.1 |
| Liberalism | 0.46 | 1.65 | -1.54 (liberal) | 2.12 (conservative) |

***State Public Opinion (General Policy Liberalism)***

State public opinion (general policy liberalism) is calculated by Erikson, Wright, and McIver (1993). They calculated standardized index scores based on surveys *by CBS/New York Times* poles from 1976 to 1988. Erikson, Wright, McIver measured state public opinion as ideological self-identification based on selected policy variables that reflect the usual ideological divisions between liberals and conservatives. State public opinion is a combination of state policies on 8 issues, each chosen to represent a separate aspect of state liberalism (Erikson, Wright, and McIver 1993, 75). The composite policy liberalism (state public opinion) index is constructed by summing the standardized scores on the 8 component items. Index scores are standardized, with mean zero and standard deviation one, so that each unit represents a standard deviation of policy liberalism (Erikson, Wright, and McIver 1993, 77).

***League of Conservative Voters (LCV) Score***

The LCV (League of Conservative Voters) score includes pro votes for selected environmental issues by senators and representatives from 1970 to 1990. The LCV score consists

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of percent of pro-environment votes cast by members of House and Senate (national Congress). Not voting counts as an anti-environment position and lowers the member's or state's score. The high League of Conservative Voters score states were Massachusetts (81.1), Vermont (72.6), Rhode Island (72.6), and Maine (71.7). The lowest LCV score states were Mississippi (20.0), Utah (21.0), Idaho (22.7), and Alaska (48.0).

## Measurement of Recycling Commitment Model

Indicators measuring both demand and market sides of recycling are examined in this study. Market side of recycling is represented with number of paper mills ranked by the states. Percentage of people served by curbside recycling programs measures demand side of recycling. Yard waste ban refers to solid waste disposal regulation to reduce landfilling.

**Table 9. Recycling Commitment Model: Summary Statistics**

| *Variables* | *Definition* | | | |
|---|---|---|---|---|
| Paper Mills | Number of paper mills ranked by states | | | |
| Recycling Commit. | RENEW America recycling commitment score | | | |
| Population Density | State population density | | | |
| Yard Waste Ban | Yard waste ban (dummy) | | | |
| Curbside Programs | Percent of people served by curbside programs | | | |
| *Variables* | *Mean* | *Std. Deviation* | *Minimum* | *Maximum* |
| Paper Mills | 2.38 | 2.60 | 1 (rank) | 50 (rank) |
| Recycling Commit. | 4.46 | 2.52 | 1 (score) | 10 (score) |
| Population Density | 71.8 | 25.9 | 1.0 | 967.1 |
| Yard Waste Ban | 0.46 | 0.50 | 0 (no ban) | 1 (ban) |
| Curbside Programs | 40.7 | 28.9 | .05% | 95.0% |

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***Yard Waste Disposal Ban***

A state recycling regulation, yard waste disposal ban is included in the analysis. Existence of yard waste disposal ban is coded as: (1) and absence of ban coded as (0), Kemp (1981) warned that it is the stringency of regulations, not their presence or absence, that is of crucial importance in regulatory politics. The data are compiled from *Biocycle* 1997 issue.

***Number of Paper Mills Ranked by States***

A proxy variable, number of paper. cardboard, and pulp mills ranked by states are used to measure the strength of the recycling market. Paper and paper products consist of almost 40 % of the municipal solid waste stream. Recyclable paper prices fluctuate due to weak market conditions and inadequate paper mills. Idaho, Nebraska, Nevada, South Dakota, Utah, and Wyoming rank first with no mill. States with highest number of mills, or rank best in terms of number of paper, cardboard, and pulp mills have relatively low landfilling rates as expected. These states are -in the order- Maine, Wisconsin, Vermont, New Hampshire, and Oregon. The original source of data is *Lockwood-Post's Pulp and Paper 1990 Directory* published by Miller Freeman Publications. The data are borrowed from Hall and Knerr's *1991-92 Green Index*. Number of mills in 1989, including some at multi-plant sites, is ranked at per-capita basis.

***Recycling Commitment Score by RENEW***

Recycling commitment score is a rating composed by RENEW America in 1989. This data also is published in Hall and Knerr's Green Index (1991). The original data published in "The State of the States" by RENEW America. Ten is the possible highest ranking.

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The highest rated states are Oregon (10), Connecticut (9), Illinois (8), Indiana (8), Iowa (8), Minnesota (8), New York (8), Pennsylvania (8), Rhode Island (8), and Wisconsin (8). The lowest rated states are Arizona (1), Mississippi (1), South Carolina (1), Alabama (2), Arkansas (2), Hawaii (2), Louisiana (2), Montana (2), North Dakota (2), South Dakota (2), Tennessee (2), and Utah (2).

## Statistical Analysis Methods and Expectations

Multiple regression analysis is the major statistics used in this study. Multiple regression analysis is utilized to find determinants or factors of state landfilling rate. To indicate the relative importance of the factors in each model for explaining the variation in landfilling rate (dependent variable), the magnitude of the standardized partial regression coefficients (beta weights) are used. Beta coefficients do not measure explained variance.

R-square measures explain portion of the variance in the dependent variable considering all variables simultaneously. Beta weights are used as evidence of the relative importance of each variable, when all others are controlled, in explaining variation in the dependent variable, when all others are controlled, in explaining variation in the dependent variable. Because these coefficients are produced as a statistical function including all model variables simultaneously, the resulting order of importance (magnitude) may be different from that inferred from bivariate correlation coefficients.

Three relationships (goals) are sought in this statistical analysis. The first one is to understand the relationships between dependent and independent variables by Beta coefficients. Variables with very small values for Beta weights and *t* are removed from the initial multiple regression analysis.

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The second goal is aimed at understanding whether each major hypothesis significantly (and their associated theoretical constructs or models) contributes in explaining variation in the dependent variable.

The third goal is to understand determinants of landfilling rate in a more complex model including theoretically strong variables from each limited model. A few variables are selected based on theoretical importance from each model and they are re-analyzed in the integrated model.

Each theoretical construct (model) was separately analyzed. Bivariate relationships (Pearson's correlation coefficients) are reported to check multicollinearity. Multivariate regression analysis is used to assess the strength of the relationship between the independent variables and the dependent variable (landfilling rate).

Beta weights are particularly important to understand relative importance of each variable due to different measurement scale for each variable. Whenever a variable shows a very low Beta coefficient and t value comparing other variables in the model, if that variable and other variables with similar characteristics are not theoretically important, they are dropped from the analysis and revised multiple regression analysis results are reported with less number of variables.

In the next section, correlations among the variables and multiple regression analysis results are reported. Each model is analyzed separately first. Then theoretically important variables from each model are re-analyzed for the integrated model. Interpretation of results and a theoretical discussion are given in next chapter. In the next section of this chapter, findings are reported but they are not discussed.

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## Findings

### Findings from the Issue Severity Model

The issue severity model shows that the higher the solid waste disposal issues, the lower the landfilling rate. Landfill tipping fees, remaining landfill capacity, and percentage of metro population highly correlate with the dependent variable at a significant level as seen in table 10 (correlation matrix).

**Table 10. Issue Severity Model: Correlation Matrix**

| Variables | Definition |
|---|---|
| Dependent | Percent municipal solid waste landfilled |
| Spending | Per ton state spending to manage solid and hazardous wastes |
| Income | State per capita income |
| Product | Percent change in per capita gross product: 1981-91 |

| | Dependent variable | Landfill tipping fee | Metro population | Landfill capacity | MSW generation |
|---|---|---|---|---|---|
| Dependent variable | 1.000 | -0.750 | -0.322 | 0.441 | -0.068 |
| | . | (0.000) | (0.011) | (0.001) | (0.318) |
| Landfill tipping fee | -0.750 | 1.000 | 0.177 | -0.356 | -0.096 |
| | (0.000) | . | (0.110) | (0.006) | (0.254) |
| Metro population | -0.322 | 0.177 | 1.000 | -0.093 | 0.236 |
| | (0.011) | (0.110) | . | (0.260) | (0.049) |
| Landfill capacity | 0.441 | -0.356 | -0.093 | 1.000 | 0.010 |
| | (0.001) | (0.006) | (0.260) | . | (0.471) |
| MSW generation | -0.068 | -0.096 | 0.236 | 0.010 | 1.000 |
| | (0.318) | (0.254) | (0.049) | (0.471) | . |

Numbers in parentheses are significance level (one-tailed).

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Per capita solid waste generation is expected to be negatively related with the dependent variable since higher waste generation is assumed to urge policymakers for reducing landfilling rate. However, per capita solid waste generation was found to be insignificant and not strong in explaining state landfilling rate.

Beta weights are used to compare relative importance of the variables. In issue severity model, high Beta weight (-0.64) of tipping fee variable in revised regression analysis (table 11) indicates that landfill tipping fee is relatively more important than other variables in the model. Percentage of metro population (Beta weight = -0.18), and remaining years of landfill capacity (Beta weight = 0.19) also are statistically significant variables in the issue severity model.

The initial issue severity multiple regression model explains 60 % of the variation in the dependent variable (landfilling rate). Per capita MSW generation was dropped in the revised multiple regression analysis because its correlation with percentage of metro population (0.236) is bigger than correlation between the dependent variable and per capita MSW generation (0.068).

After insignificant per capita municipal solid waste generation was removed from the analysis, the revised multiple regression model yields all significant variables and explains 61 % of the variation in the dependent variable (table 11). Landfill tipping fees variable is the strongest variable in the limited issue severity model. Beta coefficient for landfill tipping fees is -0.66 in the initial and -0.64 in the revised model (table 11).

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**Table 11. Issue Severity Model: Multiple Regression**

Initial Model

| | Variables | Coeff. | SE B | Beta | TSig T |
|---|---|---|---|---|---|
| Tipping Fees | -0.427 | 0.10 | -66 | -6.64 | **** |
| Metro Population | -0.150 | 0.08 | -.16 | -1.72 | * |
| Landfill Capacity | 7.212 | 3.94 | .18 | 1.83 | * |
| MSW Generation | -5.914 | 5.55 | -.11 | -1.07 | |
| Constant | 105.198 | 8.64 | | 12.71 | **** |

N = 50 F-ratio = 15.73 ****

R-Square = .64 Adj. R-Square = .60

Revised Model

| Variables | Coeff. | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| Tipping Fees | -0.715 | 0.10 | -.64 | -6.68 | **** |
| Metro Population | -0.173 | 0.08 | -.18 | -2.08 | ** |
| Landfill Capacity | 7.630 | 3.79 | .19 | 2.01 | ** |
| Constant | 100.060 | 7.01 | | 14.26 | **** |

N = 50 F-ratio = 26.33 ****

R-Square = .63 Adj. R-Square = .61

* Statistically significant at .10 level

** Statistically significant at .05 level

*** Statistically significant at .01 level

**** Statistically significant at .001 level

## Findings From the State Institutional Capacity Model: Economic Strength

The main hypothesis of the economic strength is that the higher the economic strength of a state, the more likely that state is able to achieve lower rate of landfilling. Other alternative disposal methods are, in general, more costly than landfilling; therefore, states

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with higher economic capacity can promote environmentally desirable disposal alternatives like recycling and source reduction.

**Table 12. State Institutional Capacity Model; Economic Strength: Correlation Matrix**

| Variables | Definition |
|---|---|
| Dependent | Percent municipal solid waste landfilled |
| Spending | Per ton state spending to manage solid and hazardous wastes |
| Income | State per capita income |
| Product | Percent change in per capita gross product: 1981-91 |

| | Dependent variable | SWM spending | Per capita income | Product change |
|---|---|---|---|---|
| Dependent variable | 1.000 | -0.360 | -0.574 | -0.660 |
| | . | (0.005) | (0.000) | (0.000) |
| SWM spending | -0.360 | 1.000 | 0.260 | 0.173 |
| | (0.000) | (0.034) | . | (0.001) |
| Product change | -0.660 | 0.173 | 0.442 | 1.000 |
| | (0.000) | (0.115) | (0.001) | . |

Numbers in parentheses are significance level (one-tailed).

The bivariate correlation between independent variables and landfilling rate that are displayed in the first column is of particular interest. Table 12 shows that percentage change in per capita gross state product from 1981 to 1991 and per capita income of 1993 are highly correlated with dependent variable (-0.660 and -0.574 respectively). Correlation between per ton state spending to manage solid and hazardous wastes and the dependent variable is low (-0.360). All three variables are significant at 0.01 level.

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**Table 13. State Institutional Capacity Model; Economic Strength: Multiple Regression**

| Variables | Coeff. | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| Spending | -1.482 | 0.76 | -0.19 | -1.94 | * |
| Income | -0.002 | 7.56 | -0.30 | -2.78 | *** |
| Product | -0.373 | 0.08 | -0.49 | -4.54 | **** |
| Constant | | 138.72 | 13.48 | 10.28 | **** |
| | N = 50 | | F-ratio = 20.32 **** | | |
| | R-Square = .59 | | Adj. R-Square = .54 | | |

* Statistically significant at .10 level

** Statistically significant at .05 level

*** Statistically significant at .01 level

**** Statistically significant at .001 level

It can be concluded from these bivariate relationships that states with a higher per capita income, higher spending to manage solid and hazardous wastes, and higher growth in the economy are more likely to have low municipal solid waste landfilling rate. In summary, states that enjoy greater economic strength have lower landfilling rate. The relationships of each independent variable with other independent variables are lower than the relationship between particular independent variable and dependent variable. All three variables are statistically significant in the multiple regression analysis.

Percent change in per capita gross state product from 1981 to 1991 is of particular interest. Its Beta weight as seen in table 13 (-0.49) is the highest among the three variables in the economic strength model. Collectively, economic strength model yields an adjusted R-square of 0.54 in an equation with landfilling rate. This model also yields a high and

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significant (at 0.001 level) F ratio (20.32). This indicates that 54 % of the variance of land-filling rate is explained by economic strength model.

## Findings From the State Institutional Capacity Model: Legislative,Innovative, and Administrative Strength

General institutional capacity, a dummy variable, is highly correlated (-0.565) with the dependent variable at 0.001 level (table 14). Correlation (-0.632) with dependent variable and beta weights (table 15) show that innovation is the strongest variable in this model.

Correlation between administrative centralization (bureaucratic consolidation) and landfilling rate (-0.098) is very weak. This variable is collinear with innovation (-0.229). This finding is consistent with previous research where bureaucratic consolidation, in general, has been found either not related to state environmental policy outputs, or the relationship is weak. Similarly, legislative professionalism is not strongly correlated with dependent variable and it is not significant. However, it is in the expected direction (-0.174) and close enough to be significant at 0.10 level.

Cummings (1990, 284), who used same measurement of bureaucratic centralization, found similar result that Beta coefficient for bureaucratic consolidation was not significantly related to two measurements (dependent variables) of state solid waste management. Contrary to measurement and findings in this study and in Cummings' study, Lester et al. (1983, 276) used a dual index of bureaucratic consolidation that is specific to state environmental organizations. They found that centralization played an overwhelmingly important role (positively correlated) in determining levels of hazardous waste policies in states with less

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critical circumstances. This finding was achieved by using control categories of high and low problem severity measured as the quantity of toxic chemicals generated.

**Table 14. State Institutional Capacity Model; Legislative, Innovative, and Administrative Strength: Correlation Matrix**

| Variables | Definition |
|---|---|
| Dependent | Percent municipal solid waste landfilled |
| Capacity | General institutional capacity (dummy) |
| Centralization | Administrative Centralization (category) |
| Innovation | Environmental initiatives and innovation score |
| Employment | Number of full-time equivalent solid waste management employees |
| Professionalism | Legislative professionalism index |

| | Dependent variable | Institutional capacity | Innovation score | Degree of centralization | SWM employment | Legislative Profession. |
|---|---|---|---|---|---|---|
| Dependent | 1.000 | -0.565 | -0.632 | -0.098 | 0.066 | -0.431 |
| variable | . | (0.000) | (0.000) | (0.249) | (0.323) | (0.001) |
| Institutional | -0.565 | 1.000 | 0.555 | 0.042 | -0.128 | 0.401 |
| capacity | (0.000) | . | (0.000) | (0.385) | (0.189) | (0.002) |
| Innovation | -0.632 | 0.555 | 1.000 | -0.229 | -0.171 | 0.520 |
| score | (0.000) | (0.000) | . | (0.055) | (0.117) | (0.000) |
| Degree of | -0.098 | 0.042 | -0.229 | 1.000 | -0.119 | -0.086 |
| centralization | (0.249) | (0.385) | (0.055) | . | (0.204) | (0.276) |
| SWM | 0.066 | -0.128 | -0.171 | -0.119 | 1.000 | -0.113 |
| employment | (0.323) | (0.189) | (0.117) | (0.204) | . | (0.217) |
| Legislative | -0.431 | 0.401 | 0.520 | -0.086 | -0.113 | 1.000 |
| Profess. | 0.001 | 0.002 | 0.000 | 0.276 | 0.217 | . |

Numbers in parentheses are significance level (one-tailed).

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The correlation between full-time employment and the dependent also is very weak and not significant. Since full-time employment is not correlated with the dependent variable and correlation with other variables are larger than the correlation with dependent variable, it is dropped in the revised multiple regression model (table 15).

The initial regression model was revised because of multicollinearity, low correlation, and low *t* values of full-time employment and legislative professionalism as seen in tables 14 and 15. Administrative centralization was not removed despite its very low correlation because its *t* value in the initial model was -2.04, which is considerably higher than full-time employment (-0.70) and legislative professionalism (-0.75). In the revised model, the increase in adjusted R-square is minimal (from 0.46 to 0.47) despite the removal of both full-time employment and legislative professionalism. F-ratio increases from 9.52 to 15.72. The revised model explains 47 % of the variation in the dependent variable. The revised model shows that state innovative capacity is the strongest variable (Beta weight = -0.53).

**Table 15. State Institutional Capacity Model; Legislative, Innovative, and Administrative Strength: Multiple Regression**

Initial Model

| Variables | Coeff. | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| Capacity | -9.784 | 5.05 | -.24 | -1.93 | * |
| Centralization | -3.515 | 1.71 | -.22 | -2.04 | ** |
| Innovation | -0.746 | 0.18 | -.54 | -4.10 | **** |
| Employment | -0.714 | 1.02 | -.07 | -0.70 | |
| Professionalism | -.0.002 | 0.00 | -.08 | -0.75 | |
| Constant | 118.936 | 12.24 | | 9.71 | **** |
| N = 50 | | | F-ratio = 9.52 **** | | |
| R-Square = .51 | | | Adj. R-Square = .46 | | |

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**Table 15. State Institutional Capacity Model ... — *Continued***

Revised Model

| Variables | Coefficient | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| Capacity | -10.119 | 4.99 | -.25 | -2.02 | ** |
| Centralization | -3.244 | 1.67 | -.21 | -1.93 | * |
| Innovation | -0.729 | 0.17 | -.53 | -4.10 | **** |
| Constant | 114.824 | 10.32 | | 11.11 | **** |
| | N = 50 | | F-ratio = 15.72 **** | | |
| | R-Square = .47 | | Adj. R-Square = .47 | | |

* Statistically significant at .10 level

** Statistically significant at .05 level

*** Statistically significant at .01 level

**** Statistically significant at .001 level

## Findings From the Public Opinion and Liberalism Model

The statistical analysis shows that the political and ideological preferences of elite (policymakers and politicians) and general public are related with state landfilling rate. As expected, liberal policymakers seem more supportive of environmental policies than conservative policymakers. The high correlation (0.792) between policy liberalism and the LCV score as seen in table 16 may be considered as multicollinearity problem. Bivariate correlation shows that policy liberalism negatively correlated (-0.439) with the dependent variable.

If the LCV score is dropped from the analysis (not shown in the table), policy liberalism becomes a strong (highly correlated) variable of the public opinion and liberalism model. This meant that policy liberalism impacts landfilling ratio and more liberal public opinion are related to lower landfilling rate. Results imply that conservative policymakers are

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less committed to reduce landfilling. As seen in table 17, public opinion and liberalism model explains 47 % of the variation in the dependent variable.

**Table 16. Public Opinion and Liberalism Model: Correlation Matrix**

| Variables | Definition | | |
|---|---|---|---|
| Dependent | Percent municipal solid waste landfilled | | |
| LCV Score | LCV Score on Environment (Both Houses) | | |
| Liberalism | Standardized index of composite policy liberalism | | |
| | Dependent | LCV Score | Liberalism |
| Dependent | 1.000 | -.681 | -.439 |
| | . | (.000) | (.001) |
| LCV Score | -.681 | 1.000 | .792 |
| | (.000) | . | (.000) |
| Liberalism | -.439 | .792 | 1.000 |
| | (.001) | (.000) | . |

Numbers in parentheses are significance level (one-tailed).

**Table 17. Public Opinion and Liberalism Model: Multiple Regression**

Initial Model

| Variables | Coeff. | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| LCV Score | -1.079 | 0.21 | -.89 | -5.12 | **** |
| Liberalism | 5.451 | 3.52 | .26 | 1.54 | |
| Constant | 116.933 | 10.06 | | 11.61 | **** |
| | N = 48 | | F-ratio = 21.65 **** | | |
| | R-Square = .49 | | Adj. R-Square = .47 | | |

* Statistically significant at .10 level

** Statistically significant at .05 level

*** Statistically significant at .01 level

**** Statistically significant at .001 level

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## Findings From the Recycling Commitment Model

Alternative disposal methods are not limited to recycling. Source reduction also is a highly important alternative but it is difficult to measure. The other alternative disposal method, incineration, has been more utilized in densely populated large metropolitan areas where tipping fees are high. Many sparsely populated states have either no or little incineration capacity. Each state has a certain goal to increase its recycling rate. Moreover, recycling and composting together are the second largest disposal method for municipal solid wastes. Therefore, recycling was used in explaining landfilling, but incineration and source reduction are excluded.

All five variables in the recycling commitment model are correlated in the expected (negative) direction with the dependent variable as seen in table 18. Recycling market was measured as by number of paper mills ranked by state in this analysis. Correlation of -0.468 indicates that availability of more paper mills is directly correlated with lower landfilling rate.Both demand and supply side of recycling is important; however, demand size is more emphasized. Processing collected recyclable and consuming materials made from recycled ingredients represents the recycling market. Paper mills accepting recycled paper are important since almost 40 % of municipal solid waste stream consist of paper. Paper and paper products are easier to recycle, and it is frequently recycled. Therefore, having more paper mills accepting recyclable in a state may impact both recycling and landfilling rates. The highest correlation (-0.585) with the dependent variable (table 18) among the independent variables of recycling commitment model comes from recycling commitment score calculated by RENEW. States with high commitment to recycling may reduce landfilling rate.

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**Table 18. Recycling Commitment Model: Correlation Matrix**

| Variables | Definition |
|---|---|
| Dependent | Percent municipal solid waste landfilled |
| Paper Mills | Number of paper mills ranked by states |
| Recycling Commitment | RENEW America recycling commitment score |
| Population Density | State population density |
| Yard Waste Ban | Yard waste ban (dummy) |
| Curbside Programs | Percent of people served by curbside programs |

| | Dependent variable | Paper mills | Recycling Commitm. | Population density | Yard waste ban | Curbside programs |
|---|---|---|---|---|---|---|
| Dependent variable | 1.000 | -0.468 | -0.535 | -0.480 | -0.370 | -0.486 |
| | . | (0.000) | (0.000) | (0.000) | (0.004) | (0.000) |
| Paper mills | -0.468 | 1.000 | 0.109 | 0.019 | 0.088 | 0.064 |
| | (0.000) | . | (0.226) | (0.447) | (0.272) | (0.329) |
| Recycling commitm. | -0.535 | 0.109 | 1.000 | 0.518 | 0.264 | 0.753 |
| | (0.000) | (0.226) | . | (0.000) | (0.032) | (0.000) |
| Population density | -0.480 | 0.019 | 0.518 | 1.000 | 0.270 | 0.580 |
| | (0.000) | (0.447) | (0.000) | . | (0.029) | (0.000) |
| Yard waste ban | -0.370 | 0.088 | 0.264 | 0.270 | 1.000 | 0.307 |
| | (0.004) | (0.272) | (0.032) | (0.029) | . | (0.015) |
| Curbside programs | -0.486 | 0.064 | 0.753 | 0.580 | 0.307 | 1.000 |
| | (0.000) | (0.329) | (0.000) | (0.000) | (0.015) | . |

Numbers in parentheses are significance level (one-tailed).

When the percent of people served by recycling program increases, landfilling rate decreases. The high correlation (0.580) between density and the percent of people served by curbside recycling programs is related to the higher cost of recycling in sparsely populated areas. The percent of people served by recycling programs is not significant and both *t* value

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(-0.33) and standardized regression coefficient (Beta weight = -0.05) are relatively low comparing other variables in the model (table 19). Recycling ban (a dummy variable) is negatively correlated with landfilling rate (-0.370) at almost 0.001 significance level.

**Table 19. Recycling Commitment Model: Multiple Regression**

Initial Model

| Variables | Coeff. | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| Paper Mills | -0.530 | 0.13 | -.41 | -4.06 | **** |
| Recycling Commitment | -2.127 | 1.22 | -.27 | -1.74 | * |
| Population Density | -0.024 | 0.01 | -.25 | -1.99 | * |
| Yard Waste Ban | -6.947 | 4.19 | -.17 | -1.65 | |
| Curbside Programs | -0.037 | 0.11 | -.05 | -0.33 | |
| Constant | 97.532 | 5.03 | | 19.38 | **** |
| | N = 50 | | F-ratio = 10.85 **** | | |
| | R-Square = .55 | | Adj. R-Square = .50 | | |

Revised Model

| Variables | Coeff. | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| Paper Mills | -0.529 | 0.12 | -.41 | -4.10 | **** |
| Recycling Commitment | -2.387 | 0.93 | -.30 | -2.56 | ** |
| Population Density | -0.025 | 0.01 | -.26 | -2.23 | ** |
| Yard Waste Ban | -7.123 | 4.12 | -.18 | -1.72 | * |
| Constant | 97.421 | 4.97 | | 19.59 | **** |
| | N = 50 | | F-ratio = 13.81 **** | | |
| | R-Square = .55 | | Adj. R-Square = .51 | | |

* Statistically significant at .10 level

** Statistically significant at .05 level

*** Statistically significant at .01 level

**** Statistically significant at .001 level

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## Findings From the Integrated Model

As the final model, the integrated model is presented. Variables for the integrated model are selected based on the literature review along with both the constructs developed and other 5 models. At least one variable of these constructs are thought to be theoretically important and needs to appear in the integrated model. The integrated model consists of 9 variables. Similar to Ringquist (1993b and 1994), variables in the integrated model are first analyzed in their respective limited models. were analyzed first. If correlation between independent variables is higher than .80, then multicollinearity problem is considered to evaluate or drop some variables. According to table 20, there is no multicollinearity variable of this type.

The multivariate regression analysis of the integrated model gives mixed results. All of the variables in the integrated model, with the exception of legislative professionalism, are statistically significant in their respective models, but some of them are insignificant in the integrated model and yield very small Beta coefficients in the integrated model.

One of the reasons for these mixed results and low Beta coefficients may be because of the correlation among the independent variables. In the limited model, each independent variable correlates with a limited number of other independent variables of the similar kind. When correlation between independent variable and dependent variable is smaller than correlation with that independent variable and any other variable in the model, then multi-collinearity exists. The typical example of this type of multicollinearity problem can be observed for opinion liberalism. Correlation between opinion liberalism and the dependent variable is –0.439 and it is significant at 0.001 level as seen in table 20. Correlation of

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opinion liberalism with some other independent variables is also higher than its correlation with the dependent variable. For example, correlation between opinion liberalism and the LCV score is 0.792 and it is significant at 0.001 level. The third reason is possible because of either unhealthy measurement of independent variables or some variables are theoretically important for other environmental issues but not for municipal solid waste disposal. Legislative professionalism index seems to be an example of this.

Significant and high bivariate correlations were found among the independent variables (table 20). This result is due to the difference between simple bivariate correlation and complex multiple regression coefficients, where correlation among the independent variables are in play. Bivariate correlation coefficients are different from unstandardized or standardized regression coefficients in their ability to reflect or detect presumed causal relationship (Blalock 1979, 468-70). Simple correlation coefficients alone are not enough adequately capture the complexities of the policy process.

Correlation of per capita income with 4 independent variables is higher than its correlation with the dependent variable. Despite that, according to table 21, per capita income, the LCV score and yard waste ban have relatively large Beta coefficients in the expected direction although their *t* values are not significant. Table 21 shows that a state having yard waste ban has 3.64 % less landfilling rate. Final revised model including 3 significant and high Beta coefficient variables explains 76 % of the variation in the dependent variable. In the revised model, metro population, landfill capacity, and legislative professionalism has been dropped because of lower degree of theoretical support. Percent metro population turns to be positive instead of negative.

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**Table 20. Integrated Model: Correlation Matrix**

| | Dependent variable | Per capita income | Innovation score | LCV score | Opinion liberalism | Recycling ban | Metro population | Landfill capacity | Landfill tip. Fee | egislative profess. |
|---|---|---|---|---|---|---|---|---|---|---|
| Dependent variable | 1.000 | -0.588 | -0.639 | -0.681 | -0.439 | -0.351 | -0.310 | 0.426 | -0.837 | -0.457 |
| | . | 0.000 | 0.000 | 0.000 | 0.001 | 0.007 | 0.016 | 0.001 | 0.000 | 0.001 |
| Per capita income | -0.588 | 1.000 | 0.667 | 0.640 | 0.693 | 0.256 | 0.660 | -0.269 | 0.588 | 0.559 |
| | 0.000 | . | 0.000 | 0.000 | 0.000 | 0.040 | 0.000 | 0.032 | 0.000 | 0.000 |
| Innovation score | -0.639 | 0.667 | 1.000 | 0.762 | 0.753 | 0.274 | 0.511 | -0.326 | 0.576 | 0.591 |
| | 0.000 | 0.000 | . | 0.000 | 0.000 | 0.030 | 0.000 | 0.012 | 0.000 | 0.000 |
| LCV score | -0.681 | 0.640 | 0.762 | 1.000 | 0.792 | 0.330 | 0.283 | -0.424 | 0.742 | 0.555 |
| | 0.000 | 0.000 | 0.000 | . | 0.000 | 0.011 | 0.026 | 0.001 | 0.000 | 0.000 |
| Opinion liberalism | -0.439 | 0.693 | 0.753 | 0.792 | 1.000 | 0.135 | 0.399 | -0.233 | 0.543 | 0.648 |
| | 0.001 | 0.000 | 0.000 | 0.000 | . | 0.180 | 0.002 | 0.055 | 0.000 | 0.000 |
| Recycling ban | -0.351 | 0.256 | 0.274 | 0.330 | 0.135 | 1.000 | 0.163 | -0.438 | 0.231 | 0.152 |
| | 0.007 | 0.040 | 0.030 | 0.011 | 0.180 | . | 0.134 | 0.001 | 0.057 | 0.151 |
| Metro population | -0.310 | 0.660 | 0.511 | 0.283 | 0.399 | 0.163 | 1.000 | -0.062 | 0.254 | 0.301 |
| | 0.016 | 0.000 | 0.000 | 0.026 | 0.002 | 0.134 | . | 0.338 | 0.041 | 0.019 |
| Landfill capacity | 0.426 | -0.269 | -0.326 | -0.424 | -0.233 | -0.438 | -0.062 | 1.000 | -0.444 | -0.161 |
| | 0.001 | 0.032 | 0.012 | 0.001 | 0.055 | 0.001 | 0.338 | . | 0.001 | 0.137 |
| Landfill tipping fee | -0.837 | 0.588 | 0.576 | 0.742 | 0.543 | 0.231 | 0.254 | -0.444 | 1.000 | 0.495 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.057 | 0.041 | 0.001 | . | 0.000 |
| Legislative profess. | -0.457 | 0.559 | 0.591 | 0.555 | 0.648 | 0.152 | 0.301 | -0.161 | 0.495 | 1.000 |
| | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.151 | 0.019 | 0.137 | 0.000 | . |

According to table 21, the environmental initiatives and innovation score, general policy liberalism (public opinion), and landfill tipping fees are statistically significant. Initial multiple regression analysis yields a positive Beta coefficient for percentage of metro population instead of negative one.

**Table 21. Integrated Model: Multiple Regression**

| Variables | Definition |
|---|---|
| Dependent | Percent municipal solid waste landfilled |
| Per capita income | Per capita income |
| Innovation | Environmental initiatives and innovation score |
| LCV score | LCV score on environment (Both Houses) |
| Liberalism | General opinion liberalism |
| Yard waste ban | Yard waste ban |
| Metro population | Percent metro population |
| Landfill capacity | Remaining landfill capacity |
| Tipping fees | Landfill tipping fees |
| Legislative profess. | Legislative professionalism index |

Initial Model

| Variables | Coeff. | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| Income | 0.01 | 9.73 | -.16 | -1.16 | .25 |
| Innovation | -.479 | .18 | -.35 | -2.54 | ** |
| LCV Score | -.115 | .21 | -.09 | -.55 | .58 |
| Liberalism | 7.717 | 3.11 | .38 | 2.47 | ** |
| Yard waste ban | -3.640 | 3.45 | -.09 | -1.05 | .29 |
| Metro population | .037 | .10 | .04 | .37 | .71 |
| Tipping Fees | -.779 | .14 | -.65 | -5.42 | **** |
| Landfill capacity | -.764 | 3.63 | -.01 | -.21 | .83 |
| Legislative profess. | -.307 | 1.10 | -.02 | -.27 | .78 |
| Constant | | | | | |

N = 48 F-ratio = 16.29 ****

R-Square = .79 Adj. R-Square = .74

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**Table 21. Integrated Model: Multiple Regression -- *Continued***

First Revised Model

| Variables | Coeff. | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| Income | -9.577 | 7.68 | -.13 | -1.24 | .21 |
| Innovation | -.462 | .16 | -.33 | -2.74 | *** |
| LCV Score | -.124 | .19 | -.10 | -.63 | .52 |
| Liberalism | 7.348 | 2.85 | .36 | 2.57 | ** |
| Yard waste ban | -3.389 | 3.12 | -.08 | -1.08 | .28 |
| Tipping Fees | -.78 | .13 | -.66 | -5.91 | **** |
| Constant | 140.466 | 15.54 | | 9.03 | **** |
| | N = 48 | | F-ratio = 26.12 **** | | |
| | R-Square = .79 | | Adj. R-Square = .76 | | |

* Statistically significant at .10 level

** Statistically significant at .05 level

*** Statistically significant at .01 level

**** Statistically significant at .001 level

Statistical analysis demonstrates that the main hypotheses in this study are basically supported. This exploratory study shows that issue severity, state institutional capacity, public opinion and liberalism, and recycling commitment correlate with the state municipal solid waste landfilling rate.

This chapter supported the models (theoretical constructs) and the statistical results. The complete interpretation of the results was avoided in this chapter. Similarly, the results prompted in this chapter were not tied to the findings of other studies in comparative state policy research or to theories of policymaking and implementation. Those findings tied to the literature review, theories, and assumptions are integrated and developed in the next chapter.

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# CHAPTER X

# ANALYSIS AND DISCUSSION

## Objectives

Statistical analysis disclosed the state-to-state variation in determining solid waste landfilling rate. Solid waste landfilling rate is hypothesized to be a function of issue severity, state institutional capacity, state public opinion and liberalism, and recycling commitment. One of the goals of this study is to understand relative importance of variables within each model and relative importance of each hypothesis within integrated model. The issue severity model seems to explain most of the variation in the state landfilling rate.

The basic objective of this study is to determine why some states have a lower landfilling rate. The significant variables of the 4 models are considered as determinants of landfilling rate. Initially, each model was separately considered by examining the predictive capacity of multiple indicators.

## Issue Severity and Landfilling

The findings for tipping fees are consistent with the theory of issue severity. Statistical analysis in this study confirms that landfill tipping fees are negatively related with landfilling rate at the state level. Historical development of solid waste management practices, policies, and issues (as summarized in chapters 2 and 3) supports the empirical findings about the relationships between indicators of issue severity model and state landfilling rate.



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Findings of this study is consistent with the findings of Lester et al. (1983, 275) that American states are clearly responding to the existence of the waste problem. In their comparative state hazardous waste study, they demonstrated that state regulatory activities in hazardous wastes are functions of the hazardous waste-related issues. Similarly, Regens and Reams (1988, 61) stated that "technological pressures, including dependence upon important natural resources and/or their potential to become polluted, may lead to a need to take prompt environmental protection actions."

Findings imply that there is a strong negative relationship between landfill tipping fee and landfilling rate. Consistent with findings in this study, Hockett, Lober, and Pilgrim (1995, 213) demonstrated that "tipping fee is the only significant variable with a negative coefficient, indicating that an increase in the tipping fee is associated with a decrease in waste both deposited at the landfill and recycled." When environmentally more desirable alternatives like recycling and source reduction become cost competitive in the case of high tipping fees, their proportion in the total solid waste disposal increases, so that landfilling decreases. In other words, when landfill tipping fees of municipal solid waste have risen, other methods can be justified economically. In this sense, Folz and Hazlett (1991, 530) demonstrated that higher disposal charges in surveyed cities create an incentive to maximize recycling efforts. Similarly, Folz (1995, 299-320) indicated that dwindling landfill capacity and rising charges for waste disposal made recycling and other alternative disposal methods appealing.

Sixty-four percent of the public works directors responding to the survey administered by Feiock and West indicated that there was a shortage of landfill space in some

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communities; and an average these cities will be out of landfill in 9 years (Feiock and West 1993, 414). Similarly, McClain (1995) found that shortage of adequate disposal space result with higher recycling rate. Shortage of landfill space is considered to be a sign of garbage crisis.

Consistent with Feiock and West (1993), both bivariate correlation and beta weights in this study show that remaining landfill capacity is also important but not as important as landfill tipping fees. States with higher landfill capacity have a higher rate of landfilling. In other words, lower landfill capacity creates pressure to use alternative disposal methods instead of landfilling. Contrary to finding about landfill capacity in this study, Cummings (1990, 238) found that a state's solid waste outputs are independent of its projected landfill availability. In general terms, Edelman (1988) cautioned that the solid waste pressure conditions do not constitute demands because they are considered as a normal course of events.

Saffell (1982, 5) indicated that "population size and the presence of large metropolitan areas have important affects on state politics." Larger metro population affects both state politics and state policy outputs or behavior. States with relatively larger metro population (as ratio of metro population to total population) are more experienced with lower levels of landfilling. Cho and Frederickson investigated per capita state spending for highways, natural resources, education, correction for the 1960s. Cho and Frederickson (1973, 19) demonstrated that urbanization explains spending differences among the states. State spending per capita for infrastructure-related and environment-related issues were higher in the case of higher urbanization.

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Land is becoming increasingly expensive in densely populated urban areas making the opportunity cost of landfill space higher than before. The area used for landfill is lost to other uses even long after the landfill is closed (Huhtala 1997). As Cummings (1990, 107) noted that the intensive concentration of population increases local solid waste disposal pressures due to higher and concentrated generation of solid wastes. Higher metro population increases disposal costs due to possible high cost of land and higher transportation costs. Even if enough landfill capacity exists, recycling may become easier and more cost-effective in the case of high metro population. With increasing metro population, landfilling rate may decline and cost-effectiveness of alternative disposal methods may increase.

Similar to our findings, Thomas (1991, 513-14) hypothesized that urbanization and environmental interest groups are likely to increase pressures for controls on pollutants and land use planning. Feiock and West (1993, 409) found that landfill area, landfill capacity, and population had significant effects on the likelihood of adoption of municipal curbside recycling programs.

Few researchers found that issue severity is not correlated with the environmental policy outputs or environmental commitment. For example, Hays, Esler, and Hays (1996) found that states' environmental conditions and the influence of federal government play virtually no role in explaining variation in state commitment to environmental protection. Alter (1991) indicated that solid waste crisis is basically not due to per capita municipal solid waste generation. The total municipal solid waste generation has increased due to population increase. In this study, issue severity is crucial in explaining landfilling rate.

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Saffell (1982, 4) indicated that "public policymaking is affected by a variety of factors operating outside the formal structure of state and local governments." Findings of this study are highly consistent with Saffell's statement. This study shows - both theoretically and empirically - that a state's physical conditions, environmental issues, and economic characteristics influence landfilling rate. In summary, landfilling rate is determined by economic conditions, innovative capacity, and solid waste disposal issues.

## State Institutional Capacity and Landfilling

Results of statistical analysis in this study show that issue severity and innovativeness dimension of state institutional capacity are highly related to state landfilling rate. In general, indicators of economic and innovative state capacity are significant and strong. Other state institutional capacity variables are either less important or not related to landfilling rate. For example, legislative professionalism (capacity), measured by Bowman and Kearney, is insignificant.

### State Economic (Fiscal) Strength

All the variables of economic capacity are strong indicators of state landfilling rate. Roughly stated, this study suggests that states with higher economic capacity are more likely to have lower landfilling rates than other states. The greater per capita income does not necessarily mean greater financial flexibility for states; however, percent change of gross per capita income shows the financial strength and flexibility of the states. Regens and Reams (1988, 61) concluded:

> Because the need for and availability of technical expertise may affect the extent and nature of state responses, more affluent states potentially have greater capability to support financially vigorous policy efforts in environmental protection.

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This explanation fits perfectly with the incineration, relatively expensive way of disposing waste, and its larger utilization in richer and densely populated states of Northeast, Great Lakes and Florida.

In general, bias occurs against economic inputs when non-fiscal output measure, like landfilling rate in this study, is used as dependent variable. The reverse is more likely to happen. When a fiscal measure of dependent variable is used, economic factors become the primary explanator of the variation. In this study, a more theoretically sound non-fiscal measure of state landfilling rate is used. Economic factors are relatively important despite possible bias of non-fiscal measurement of dependent variable.

Ringquist (1993b, 107) found that higher levels of per capita personal income and industrialization are associated with stronger air quality regulations, though other measure of wealth, per capita state expenditures, has no significant effect on air quality regulation. Dropping per capita state expenditures from the analysis did not affect explanatory power of his economic model of state policy influence. In summary, Ringquist demonstrated that wealthier states both demand and can afford stronger air pollution control programs. Cummings (1990, 298) demonstrated that per capita income significantly correlated with solid waste management activity level.

### State Legislative, Innovative, and Administrative Strength

Legislative professionalism, and bureaucratic consolidation are unimportant factors in determining state landfilling rate in this study. Contrary to findings in this study, Ringquist (1993b, 110) found that there is a strong association between legislative professionalism and

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the strength of a state's air pollution control programs. Ringquist (1993b, 111) further concluded that within the integrated model -consist of economic, interest group, political variables- legislative professionalism is the most powerful predictor of regulatory program strength. Finding insignificant impact of legislative professionalism is more surprising than finding bureaucratic consolidation is not related to landfilling rate. The reason is that there is a strong theoretical background for legislative professionalism to be related with state policy outputs and outcomes.

The possible causes of finding about legislative professionalism are explained below. Normally, it may be expected when landfilling problems are more severe, policymakers (consisting appointed and elected bureaucrats and legislatures) intervene to the issue and create policies and programs to solve problems. As possible prime policymakers in solid waste management at the state level, professional legislatures may create the most effective policies to reduce landfilling when issues, like very limited remaining landfill capacity, higher tipping fees, arise.

Another explanation of insignificant legislative professionalism may be because of the linkage between legislative professionalism and metro population in addition to linkage between legislative professionalism and state economic capacity. States with high economic capacity can afford relatively more expensive recycling and composting programs, which when utilized, contribute to lower landfilling rate. In this case, legislative professionalism becomes an indirect factor in explaining landfilling rate and main factor is economic strength. Similarly, both densely populated and high metro population states have more

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professionalized legislatures. The impact of legislative professionalism disappears when metro population is considered as a variable in the analysis.

The fact that local governments and private companies are mainly responsible from collection and disposal of municipal solid wastes may be downgrading the importance of state legislatures. The expertise of bureaucrats, not the professionalism of legislatures, may be more crucial in creating or modifying solid waste policies at the state level. Here, the expertise of bureaucrats is not included in the analysis, only bureaucratic consolidation is in the regression analysis. Finally, the specific characteristics of solid waste management and especially recycling and participation may affect state landfilling rate, so that legislative professionalism becomes relatively unimportant factor.

**Liberalism, Public Opinion, and Landfilling**

Both the LCV (League of Conservative Voters) score (measured as pro environmental votes of states' representatives and senators in Congress) and general policy liberalism factor score are statistically significant. Both of these variables are strong factors in determining landfilling rate when they are regressed separately with landfilling rate.

Hays, Esler, and Hays (1996) concluded that states with liberal public opinion, liberal legislatures, and professionalized interest groups are the most committed to environmental protection. Similarly, Ringquist (1993b, 167) found that legislative professionalism, liberal public opinion, and environmental group strength are all associated with state water control programs. Ringquist (1993b, 168), based on his integrated causal model, concluded that states respond positively to public opinion of water pollution issue. Theoretically, Harrigan (1994, 122) assumed that

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> For policy impact, public opinion is a very weak channel of citizen input (comparing interest groups). Public opinion does not have a direct effect on most issues that governments face. Public opinion is most effective on visible and highly emotional issues. ... There is some evidence of that elected public officials share a consensus of values with the majority of their constituents.

The findings of this study suggest that state characteristics (like issue severity, density, recycling market availability) play important roles in landfilling rate. In addition, both environmental commitment and liberalism (the LCV score, environmental innovativeness, and general policy liberalism) also play crucial roles in state solid waste management in general and state landfilling rate in particular. With the exception of Florida and Arkansas, states with low landfilling rates and states with high landfilling rates are geographically grouped. Low landfilling rate is achieved in all of the Northeast, Great Lakes, Pacific Coast states with few exceptions. The least landfilling rate is observed in the Northeast, Great Lakes, West Coast, and Florida where environmental awareness are always high enough to create pressures (Hall and Knerr 1991; Kreith 1994).

## Recycling Commitment and Landfilling

In this study, solid waste disposal methods are landfilling, incineration and recycling. Recycling is the second largest method of solid waste disposal (27%) in the United States (Goldstein and Glenn, 1997). The majority of the cities answering a survey by Feiock and West (1993) suggested that recycling is a major alternative response to reduce dependence on landfills. In general, as Everett (1989) and others also demonstrated that higher recycling is associated with limited landfill capacity, and various land-based solid waste disposal issues like groundwater contamination from landfills.

In the same fashion, landfill capacity problems are expected to be associated with higher incineration rate. However, according to a National Renewable Energy Laboratory

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study prepared by Communication Channels Inc. (1994), the decision to deliberate waste-to-energy reportedly is not related to landfill availability, and in terms of population growth, no significant difference was found between WTE and non-WTE counties. Nevertheless, this study measures landfill availability as the number of landfills per capita, not by remaining years of landfill capacity. Sometimes landfill tipping fees not available landfill capacity is critical in promoting alternative disposal methods such as recycling and incineration. Finally, this study considered only WTE facilities not other types of incineration facilities.

Stronger local recycling markets, better collection programs, and higher public participation contributes to higher recycling. Previous studies on local recycling program success found other important determinants of recycling rate. These other determinants are design and frequency of collection, distribution of free bins, charging collection fee for garbage but not for recycling, and market availability (Folz and Hazlett 1991; Folz, 1995). Local governments are important in achieving higher recycling rates as much as state governments.

Everett (1989) demonstrated that the implementation and strength of a statewide or local recycling programs are related to the state's municipal solid waste disposal situation, the anticipated market conditions for recycled materials, and environmental awareness of the state population. Everett (1989) also found that statewide and local mandatory recycling programs increase with increasing magnitude of solid waste disposal problem.

Recycling commitment score is a highly significant and strong factor in explaining landfilling rate. According to some recycling experts, a link between recycling commitment and disposal capacity can be established. Recycling may be rejected or downgraded when the

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public perceives the crisis is over, which means when there is adequate disposal capacity in communities (Alter 1991, 18; De Young 1990). At that time, especially with reduced quantities of recyclable materials in municipal solid waste, they will no longer feel that recycling is worthy of contribution.

## Integrated Model and Landfilling

The integrated model is proposed as a means to better understanding the relative importance of each variable (adopted from the literature) and model (constructed from discussion and findings in the literature). Findings from analysis of the integrated model support the assumption that issue severity is important to the landfilling rate. It seems that tipping fee variable has explains the most variation according to the integrated model results. The LCV score, landfill tipping fees and state environmental innovativeness score may be quite important in determining landfilling rate.

In this analysis, mostly state characteristics rather than public policies are used as independent variables. State yard waste disposal ban, and number of waste related full-time equivalent employees are indirect indicators of state program quality; and, all other indicators can be assessed as measuring state characteristics. The recycling commitment model indirectly reflects recycling programs and policies, but no direct measurement beside disposal ban is included. Further study focusing on the impact of policies may be helpful.

In this study, legislative professionalism is not a significant variable for explaining landfilling rate. Carmines (1974, 1121) argued that the policy influence of legislative professionalism may be mediator of policy determination. Carmines argued that when state legislatures are strong and well organized, they are capable of translating diverse demands into

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policy outputs; however, Carmines did not find an independent impact of legislative professionalism on policies. When they are weak, the policy correlation is negligible. Thus overall, legislative professionalism may appear to be a "moot point" (Cummings 1990, 315); but its indirect influence could be significant when examined categorically. A proposition of the indirect influence of legislative professionalism advanced by Dye points to a need to study links between legislative professionalism and deliberate functions, and between deliberative functions and policy outcomes (Dye 1971, 208). Dye concluded that policy formation is not so much influenced by legislative structure and system differences as are the deliberative functions of legislatures.

In the case of higher density and higher tipping fees, promoting alternatives becomes both a desirable and cost-effective method. The reasons are: (1) Density makes availability of nearby land for landfills in metropolitan areas difficult and expensive. (2) Both higher landfill tipping fee and density justify establishing extensive recycling programs and incineration facilities on the basis of economic terms. Whenever land for landfills is available, landfills are preferred even for larger metropolitan areas like city of Dallas. The increasing landfilling cost and limited capacity of landfills in the states with higher density, metro and urban population, make incineration and recycling rates relatively high. In general, higher landfilling cost is due to regulations by USEPA and Congress, and public reaction, as discussed in chapters 2 and 3.

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## The Respective Roles of Federal, State, and Local Governments in Solid Waste Disposal

Federal government's critical role in state solid waste management is emphasized in the chapter 2 of this study. The primary intervention tool of federal government in solid waste management is regulation. The above explained relationship between landfilling rate and higher landfill tipping fees is what Congress intended in the 1970s and 1980s. The RCRA and many USEPA regulations intentionally caused to increase the cost of landfilling to make environmentally desirable alternative disposal methods more cost-competitive over land based solid waste disposal can be (Kovacs 1986; Kovacs 1993).

Chapters 2 and 3 serve both to provide historical and regulatory background and to assess the federal government's role in solid waste management. The indirect impact of federal government in solid waste management can be searched through in-depth case studies covering a few states. Hays, Esler, and Hays (1996, 57) believe that the federal government is limited in its ability to influence the overall level of environmental commitment in a state. They stated that "the impact of the federal government may be felt in narrower areas of environmental protection, such as the regulation of air and water quality and the disposal of hazardous waste."

There are studies in which the roles of federal government in state environmental policies are empirically examined. Vertical relationship is more important in water and air pollution or hazardous waste policies as Hays, Esler, and Hays claimed (1996). Lowry (1992) examined federal and state characteristics and intervention on state air pollution policies and policy outputs. As Rose (1973, 1162) stated "the federal government determines basic

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parameters and state and local governments influence the applied policy." In some policy areas, the role of federal government may go beyond just determination of basic parameters.

In the decades of 1970s and 1980s, comparative state policy studies were primarily concerned with explaining state policy formation (Lester and Lombard 1990, 315). More studies focusing on comparative state policy implementation are needed. Therefore, this study is a timely study wherein the chapters 2 and 3 focus on federal and state policy consequences and policy implementation, and the rest of it highlights management of land-based municipal solid waste disposal at the state level. Some comparative state policy studies emphasized the importance of federal government rather than local governments as major players in policy implementation (Lowry 1992). Regens and Reams (1988, 56) divided state activities for groundwater protection into two broad categories such as policy development and program administration. State activities about solid waste management are more likely to fall in the policy development category. Local governments probably achieve program administration in solid waste disposal.

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# CHAPTER XI

# CONCLUSIONS, POLICY SUGGESTIONS, FURTHER STUDIES, AND RECOMMENDATIONS

In the first section, the findings from statistical analysis are summarized in relation to state landfilling rate. In the section relationships among privatizing waste handling and storage, landfilling, alternative disposal methods are examined. Further studies and research are suggested in the third section. The fourth section consists of recommendations for federal, state, and local governments. Finally, the possible policy and scholarly (academic) contributions of this study are discussed.

## Summary Conclusions

### Why Do States Restrict Landfilling Rate

This study confirms that restricting the amount and toxicity of municipal solid wastes that goes to landfills is an important consideration for many states. Tables 1 and 2, chapters 2 and 3, issue severity model, and part of chapter 10 show that states restrict land-based disposal of municipal solid wastes due to increasing cost of solid waste handling and storage, landfill closures, health and environmental issues of landfills and public reaction.

Historical review of municipal solid waste disposal shows that past waste disposal practices, and technologies (their environmental and health impacts) determine how solid wastes are managed. Sometimes, it seems that not the level of solid waste disposal issues, but



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the perception of policymakers about the waste disposal issues (as discussed in chapters 2 and 7) determines newer state solid waste regulation and practices. State and federal government solid waste disposal practices and regulations seem to be formulated to be counterattack to the previous unwanted impact of solid waste disposal. When policies are determined as a counterattack to an emerging or chronological issue, short-term, end-of-pipe solutions are promoted instead of long-term preventive policies.

Solid waste disposal practices for more than a century have created land depletion, groundwater contamination, air contamination, nuisances, and other negative externalities regardless of technologies and designs applied. These continuous and increasing solid waste disposal issues become the basic concerns for state and federal governments in reducing land-based solid waste disposal.

## What Factors Do Determine State Municipal Solid Waste Landfilling Rate

These generalizations can be made on the basis of findings in this study: (1) Higher economic capacity states are more likely to have lower landfilling rate. (2) States experiencing more severe solid waste-related problems and having physical or demographic constraints are more likely to have lower landfilling rates. (3) There is a negative relationship between state environmental innovations or initiatives and state landfilling rate. (4) Both general policy liberalism and the LCV score affect landfilling rate. In other words, liberalism and landfilling rate are negatively related. (5) Recycling commitment and availability of recycling market are negatively related to state landfilling rate.

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Both statistical analysis results and historical analysis of solid waste disposal show that changing landfill tipping fees is the easiest and most effective policy options for state and local government to change landfilling rate or the way solid wastes disposed. Both issue severity model and integrated model yield highly significant and high Beta coefficient variable, landfill tipping fees. The major conclusion of this study can be summarized as that economic factors play crucial roles in determining landfilling rate. States and local governments has no control or very little control in changing their economic and fiscal capacities, however, increasing landfilling fees and giving regulatory and technical support for recycling and composting are relatively easier policy options.

## Conclusions about State Solid Waste Policy Making and Implementation

Trust in technology is high in the United States. This concept is not new in the United States and its root can be found in the municipal reform movement. Within the last hundred years, the United States has faced several solid waste collection and disposal crises. Several so called "state-of-the-art" innovations, initiatives, designs, and programs were offered as permanent solution to the solid waste disposal issues. As Melosi (1981) demonstrated that a solid waste disposal crisis cycle is seen in the United States every 15 to 30 years. Policies, standards, and programs should consider specific characteristics of the region or state and suitability of particular disposal technology for that region. Instead of trusting a particular technology like incineration as the ultimate solution to the wastes and for all times and all regions, alternatives should be sought, and expectations from technology should be lowered.

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## Landfilling, Alternative Disposal Methods, and Privatizing Waste Handling and Storage Are Interrelated

### Recycling, Source Reduction, and Landfilling

Solid waste recycling is an especially attractive strategy for state and local officials because of its potential to reduce disposal costs, conserve available landfill capacity, and contribute to national goals of energy and resource conservation (Ackerman 1997; Folz 1991, 222; Kreith 1994). Many recyclable materials are however not valuable, and some others have low value. For these reasons, few recycling programs can now pay for themselves through materials sales alone. The real economic advantages of recycling stem from the disposal costs that recycling helps to avoid (Denison and Ruston 1990, 11). Recycling is not easily increased especially after a peak (ideal) recycling rate (around 25 %) achieved. Lower public participation to recycling programs and lack of regional recycling markets for collected recyclable also impact recycling success. With the lack of supportive public attitudes and low population density recycling may become expensive, inefficient and cumbersome. In summary, recycling success depends on public participation, market availability, contamination, type and extent of curbside collection programs, and demographics.

Both recycling and composting are criticized because of possible negative environmental and health impacts. Composting and recycling cause less negative externalities than landfilling. Nevertheless, states must overcome concerns by adopting safer recycling and composting policies and minimizing negative externalities. Composting programs may be supported to a larger extent where regional markets are more readily available - generally rural states.

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## Recycling, Incineration, Source Reduction and Landfilling: How Are They Related?

Integrated solid waste management -the planned combination of landfilling, incineration, source reduction, composting, and recycling according to the conditions of the community- may be an effective state environmental policy. USEPA has developed a hierarchy of waste management options starting with source reduction, followed by re-use and recycling, incineration, and landfilling (Mishkin 1989; USEPA 1989). This hierarchical structure generally places a priority on those methods, that preserve natural resources, have fewer environmental effects, and that save valuable landfill space. An alternative view for adopting public policies relating to waste management options is that source reduction should not necessarily be included at the top of the hierarchy but should be totally distinct (Ervin 1991). Source reduction may be viewed as a unified environmental public policy option based on minimizing the storage of more wastes (Lober 1996).

If space for landfills is scarce, such as in the Northeastern United States, it may be appropriate to allow for the incineration of the non-recyclable portion of the waste stream. It may be different in the Rocky Mountain region of the United States, where more suitable and cheap land is available or where air inversions from mountain obstructions make air pollution a primary concern. Because of such geographic differences, state environmental policymakers should not evaluate nor adopt successful policies of other states until appropriate studies are conducted.

The profit structure of designing and operating incinerators create pressures for building plants as large as possible. Since the economic pressures to amortize the investment creates a need to obtain as much waste as possible, this policy may conflict with recycling

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programs. Larger scale incinerators may be considered by states as first steps toward local government's long-term commitment not to recycle. For this reason, officials may often, though not always, find it difficult to advocate both recycling and incineration at the same time (Denison and Ruston 1990, 13-14).

Another state policy to reduce dependence on landfilling is to use solid waste planning and evaluation techniques. Comprehensive municipal solid waste plans for larger and densely populated urbanized areas may be mandatory. The full and fair or comprehensive evaluation of the potential for waste reduction and recycling may be conducted by states prior to adoption of plans or projects by local governments.

An additional waste unit that contributes to the accumulation of waste stock creates a social cost not typically accounted for in the prices of commodities produced and consumed. Waste management policy should, however, take into account such hidden costs. If all the true costs of landfills are properly considered, alternative methods of waste disposal may become more cost-effective (Huhtala 1997).

By adopting state policies and programs to reduce the amount and toxicity of waste generated and disposed, a wide range of benefits can be realized. Environmental impacts and potential health risks can be diminished. Costs and handling problems associated with managing wastes can also be reduced. Waste prevention softens the demand for mining and timbering, which thereby reduces the damage and ecological effects of those activities and increases sustainability. Savings from using resources more efficiently can be realized by manufacturers and consumers alike.

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## Privatization, Regionalization, and Landfilling

During last two decades, many small landfills have closed due to state and federal requirements and increasing cost of landfilling. At the same time, several national and regional private landfill firms have secured additional disposal capacity at existing landfills and, as a result, while the number of landfills throughout the United States has decreased, the overall disposal capacity has not dropped at a comparable rate (Goldstein and Glenn 1997; Kreith 1994). Municipalities account for about 45 %, publicly-held companies account for 30 %, and independent local operators the remaining 25 % (Schweich 1992). Approximately 17 % of municipal solid waste landfills are privately-owned, 78 % are owned by local governments, 4% by the federal government, and 1 % by state governments (USEPA 1988).

The decisions that a state or municipality makes concerning the requirements for ownership, operation, and financing of processing and disposal facilities not only shape the waste management costs, but also the financial risks, operational requirements and future flexibility in operations. Private ownership of disposal facilities may be promoted by states on the basis of management expertise needed to provide efficient and effective service, degree of financial and technical risk, the source of financing (Rhyner et al. 1995, 408), and the accessibility of suitable land for disposal outside of political boundaries.

The primary disadvantage of private ownership of disposal facilities is a loss of overall control. If the service provided is unsatisfactory or if facility operations are unacceptable to a regulatory agency, the facility may be shut down with no feasible alternatives to handling the waste (Rhyner et al. 1995, 409).

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## Further Studies and Research

Prior to adopting state policies and programs, three other areas of solid waste management need to be studied in a comparative manner. The first area relates scale and the importance of both vertical and horizontal governmental relations in environmental policy making and implementation in general and solid waste disposal in particular. This study basically focuses on state solid waste management but the role and importance of federal government in shaping state solid waste disposal policies and practices are also emphasized. Local governments are crucial in administering state solid waste policies. Therefore, the impact of vertical (federal-state, state-local) and horizontal (state-state, local-local - like interstate solid waste) relationships should be examined in future studies.

The second concern in solid waste disposal is management of industrial, construction, and demolition wastes. More comparative and in-depth state studies are needed focusing on household hazardous waste, industrial waste, and demolition wastes. Americans already generate roughly as much construction and demolition wastes as municipal wastes. Industrial wastes are not well regulated and studied; and, if no precautions are taken serious environmental and health issues may arise from these wastes. In the future, industrial waste sites may be studied to reduce environmental and health hazards. Note that, despite the limited number of state comparative studies on other wastes, hazardous waste by itself is a frequent subject of comparative state policy research.

Third, more comparative state or local policy studies also are needed for toxicity reduction and pollution prevention. Both require cooperation, effort and investment by state, local, federal governments, and manufacturers. Innovative strategies for any type of wastes

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should be developed to reduce pollution at the source. With the increasing production of complex and compound toxic materials, reducing toxicity and reducing waste at source are becoming crucial in waste management.

More in-depth studies for handling all types of wastes and considering the regulation by all government levels are necessary. States and localities were found to have large differences in their solid waste programs and policy outputs. Many case studies can be performed to uncover additional information useful in developing or adopting state environmental policies for municipal solid waste.

This study can be defined as exploratory because with the possible exception of a dissertation (Cummings 1990), there is no preliminary study dealing with municipal solid waste disposal in a comparative state perspective. Therefore, framework, models and indicators for further study in comparative municipal solid waste study are needed. Different models and indicators can be offered. Using more policy variables, like recycling mandate, procurement policies, can generate better statistical analysis results. Whenever precise measurement of recycling budgets and state municipal solid waste expenditures for more recent years are available for all states, these type of economic variables can be added to the analysis.

Not only measurement of variables or statistically tested concepts, but also theoretical constructs are exploratory in this study. Another theoretical construct focusing on policies and regulation can be added to the analysis. Demographic and geographic factors can be used as a separate model. Control variables can be added to test impact of demographic and geographic variables on state landfilling rate. More importantly, using a different dependent

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variable from a different perspective and searching other aspects of solid waste disposal can contribute to understand field better.

## Recommendations for Federal, State, and Local Governments

### Recommendations for Federal Government

National policies promoting recycling and source reduction, such as packaging and labeling requirements and procurement polices should be strengthened. Successful policies adopted in Western Europe by national governments to reduce landfilling, like the British and French landfill taxes, should be examined. The strength of national government, environmental and political cultures, physical and demographic characteristics of Western European states should, however, be carefully considered before adopting any European policy. The federal government may encourage recycling in a more concerted, consistent, and coherent manner. Government efforts to increase recycling must take into account the market conditions of materials, their dynamic nature, and the effects of programs on existing recycling activities and markets.

A national policy should be based on the dual strategies of waste prevention and better materials management. The motivation for promoting municipal solid waste prevention is strong and simple. The federal government has the potential to affect products and materials that move across state boundaries. Municipal solid waste prevention techniques and materials management should be promoted as the primary solution to waste disposal.

The Office of Technology Assessment (1992, 345-47) suggests that federal government needs to play key roles in the following areas of solid waste management: (1) Appro-

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priate methods and technologies for resource recovery and recycling should be researched and supported. (2) Research should be done about the marketability of recovered materials. (3) Institutional barriers to recycling should be eliminated. (4) Governmental incentives for resource recovery and recycling should be increased. In addition, some state and local officials believe that the federal government should establish a national clearinghouse for information, encourage design for recyclability of products, provide technical assistance, and establish packaging and product regulations and guidelines to reduce waste toxicity.

## Recommendations for State Governments

States policymakers should consider the degree of control, severity of the issues, institutional capacity, physical and demographic characteristics of the community (whole state or region of the state) before adopting both solid waste and environmental policies. States have more control on recycling especially through education programs, regulation and procurement policies. Source reduction can be increased through creating strategies in which not only municipalities and states take advantage but also manufacturers can reduce cost of packaging material, environmental permits and so on. Federal and state governments are more appropriate levels of government to adopt source reduction policies.

States may encourage cooperation between the existing recycling industry and local governments for higher flexibility in designing recycling programs meeting state recycling goals (Office of Technology Assessment 1992, 317-18). States should rely on a combination of approaches. These are financial incentives, technical assistance, information dissemination and research, procurement requirements, recycling goals, and mandatory local collection of materials for recycling.

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Supporting strategies and technologies that can lead to less costly, more environmentally sound practices and regulatory policies are necessary in managing any wastes. Consumer education and solid waste related innovation and initiatives should be considered as continuous, long-term set of projects.

Suitable land conservation studies must be performed to protect groundwater contamination, save land for future land-based disposal of any type of wastes. When land is expensive, not geologically suitable or not easily accessible, other methods of solid waste disposal (recycling and composting, incineration) should be extended. Environmentally safe solid waste disposal policies should be adopted at the state level. When landfilling is reduced and these kinds of policy alternatives are promoted, limited landfill areas can be preserved for future need.

State policies promoting environmentally safer alternative disposal methods (recycling, composting, and source reduction) should be extended immediately to protect the physical environment. The few states with limited current and future landfill area potential should take emergency measures of all kinds. States with major pollution from all types of waste disposal should also focus on preventive policies like source reduction or stricter disposal regulation, and separation of any type of hazardous wastes from municipal solid waste landfills. States immediately should adopt the public policy positions to reduce volume and toxicity of both municipal and other wastes.

The declining capacity, financial difficulties of local governments, and lack of landfills in some regions of the country increase private sector involvement in solid waste disposal. It seems that private sector involvement is profitable and helpful for local governments

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nowadays. States need to take caution on private sector's increasing control of disposal capacity, which may increase interstate shipment, and the lack of control on solid waste disposal capacity.

## Recommendations for Local Governments

Full cost accounting and comprehensive plans to compare pros and cons of different disposal methods or ownership alternatives should be applied wherever possible. Moreover, if external costs, like air and groundwater pollution from incineration facilities and landfills are internalized, incinerator, landfill, and recycling operators may incorporate the cost of appropriate pollution control equipment or residue disposal charges in their balance sheets (Denison and Ruston 1990, 17).

## Recommendations for All Level of Governments

Source reduction and separating toxic or hazardous materials from municipal solid waste landfills should continue to be a top priority. Waste management plans should be comprehensive and include all types of waste, including sewage, industrial, mining, agricultural, municipal wastes whenever it is possible. The United States has substantial opportunities for waste reduction at source because of intense competition to lower cost and innovation in the private sector. Some see implementation of waste reduction at source as an intractable cultural problem, but a number of concrete steps are available to begin reducing the amount and toxicity of trash produced.

Both amount and toxicity reduction of wastes are required for protecting physical environment, human health, and water sources. Safer disposal technologies help to restore

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public confidence in waste management policies and programs (Office of Technology Assessment 1992, 7). For example, reducing the amounts and types of organic chemicals in landfills would mean less air pollution (e.g., from volatile organic chemicals) and less toxic leachate. Quantity reduction would mean that the useful life of existing and future waste management facilities would be extended and new replacement capacity could be developed at a slower rate.

Private sector's entry to solid waste disposal and increasing tipping fees make large capacity regional landfills popular. States and communities need to take precaution to prevent financial and technical burden caused by a lack of local landfill in smaller and distant communities. It should be remembered that having longer statewide capacity for landfilling does not help to smaller communities without a landfill is available in close proximity. Building transfer stations and paying high transportation costs may be a serious burden for poorer or rural communities.

Goddard (1995) claimed that waste management problems are still viewed as technological deficiencies requiring engineering 'end-of-the-pipe' solutions. Others offer holistic or hypothetical solutions disregarding all aspects of solid waste disposal issue. For example, Wiseman (1991) estimated that at the current rate of solid waste generation, the nation's solid waste for the next 500 years could be buried in a single landfill 100 yards deep, 20 miles a side. A large region of Western South Dakota is seen as a perfect geological location for landfilling of solid wastes (Lehr 1991). Similar to Wiseman, Lehr (1991) argued that if this western part of South Dakota becomes garbage site of the nation, solid waste disposal issues could be solved in a cheap and environmentally safe way. Large amounts of waste shipments

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to other states like South Dakota may downgrade the importance of recycling and source reduction. Shipment of larger amount of interstate of solid wastes also create conflict among the receiving and sending states and communities.

## Final Words and Possible Scholarly Contributions of this Study

This research shows that innovation may be important in solving environmental and solid waste related issues. Environmental initiatives and innovations may help to achieve the goal of states; however, all the state initiatives are not necessarily successful or adopted by other states. This study suggests that using specific variables of the issue severity model is needed to better examine environmental policy outputs and outcomes. For example, landfill tipping fees instead of population density or urbanization is a more specific and direct measurement of solid waste disposal issues. This study confirms that issue severity is crucial to environmental policy making and implementation.

The results of this study support the issue severity construct as one of the main determinants (models) of the state landfilling rate. From this study, the issue severity model (in comparative state environmental policy research) is strengthened.

This study integrates the political science and environmental studies literature (in general) and comparative state policy analysis to solid waste management (in particular). There are few studies dealing with municipal solid waste disposal in a comparative public policy context. Therefore, this study is exploratory in nature in understanding and examining general picture about solid waste disposal and related policies at state level comparatively.

This research has contributed to: (1) the environmental policy literature, (2) comparative state policy research, and (3) municipal solid waste management practices. The findings,

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hopefully, clarify and support the importance of issue severity, public opinion, and state innovation in environmental policy making and implementation. Historical development and regulation of solid waste treatment, storage, and disposal cautions us that there is no safe design and technology for any waste disposal. Early sanitary landfills during 1930s and incineration technologies of the early twentieth century are examples of technology flaw.

This study strengthened issue severity model in comparative state environmental policy research. The potential and extrapolating underlying reasons for state landfilling rates have extreme significance for supporting or rejecting previous academic and professionally prepared studies.

The slow anticipated progress in solid waste handling and storage indicates that the environmental issues are complex:

> Our most significant achievement over the years is the recognition that environmental problems are complex, and that long-term solutions are evasive. Unlike other government programs, environmental programs do not have a commonly recognized bottom-line; there are no absolutes and few precedents. Therefore, the search for solutions has evolved into an interactive process, requiring much learning, relearning, and consensus building. (Futornick 1995, 15)

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## REFERENCES


Ackerman, Frank. 1997. *Why do we recycle?: Markets, Values and Public Policy.* Washington D.C.: Island Press.

Agthe, Donald E., R. Bruce Billings, and James R. Marchand. 1996. Socioeconomic and political determinants of state spending on environmental programs. *American Economist* 40, no. 1 (Spring): 24-30.

Alter, H. 1991. The future course of solid waste management in the U.S. *Waste Management and Research* 9: 3-20.

American Public Works Association (APWA), Committee on Refuse Disposal. 1961. *Municipal refuse disposal.* Chicago: Public Administration Service

American Public Works Association (APWA) 1976. *History of public works in the United States.* Chicago, Ill: APWA.

Arnold, Frank S. 1995. *Economic analysis of environmental policy and regulation.* New York: John Wiley and Sons Inc.

Bardach, Eugene, and Robert Kagan. 1982. *Going by the book: The problem of regulatory unreasonableness.* Philadelphia: Temple University Press.

Barrilleaux, Charles, Richard Feiock, and Robert Crew. 1992. Indicators and correlates of state administrative characteristics. *State and Local Government Review* 24 (Winter): 12-18.




Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Belue, Mack, Gerry Newcombe, Lou Guilmette, Tom Horton, and Teree Caldwell-Johnson. 1997. Talking trash: Five solid waste pros tell you what they think you should know. *American City and County*. 112, no.11 (October): 40-55.

Berry, Frances Stokes, and William D. Berry. 1990. State lottery adoptions as policy innovations: An event history analysis. *American Political Science Review* 84: 395-416.

Berry, Frances Stokes, and William D. Berry. 1992. Tax innovation in the states: Capitalizing on political opportunity. *American Journal of Political Science* 36: 715-742.

Biocycle. 1996. Illinois takes close look at landfill capacity. *Biocycle*. 37, no. 1 (January): 10.

Blumberg, Louis and Robert Gottlieb. 1989. *War on waste: Can American wins its battle with garbage*. Washington D.C.: Island Press.

Boeckelman, Keith. 1992. The influence of state on federal policy adoptions. *Policy Studies Journal* 20, no. 3: 365-375

Bonini, Allen P. 1993. Selling recycling in a "soft" disposal climate. *Biocycle* 34, no. 6 (June): 82-83.

Bowman, Ann O'M., and Richard Kearney. 1988. Dimensions of state government capability. *Western Political Quarterly* 41, no. 2: 341-62.

Brace, Paul, and Aubrey Jewett. 1995. The state of state politics research. *Political Research Quarterly* 48, no.3 (September): 643-81.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Buchanan Robert J., Joseph C. Cappelleri, and Robert L. Ohsfeldt. 1991. The social environment and medical expenditures: Factors influencing the level of state Medicaid spending. *Public Administration Review* 51, no.1 (January / February): 67-73.

Bulanowski, G. 1981. *The impact of science and technology on the decisionmaking process in state legislatures: The issue of solid and hazardous waste.* Denver: National Conference of State Legislatures.

Capra, Fritjoh, and Charlene Spretnak. 1984. *Green politics*. New York: Dutton.

Carmines, Edward G. 1974. The mediating influence of state legislatures on the linkage between interparty competition and welfare policies. *American Political Science Review* 68, no.3: 1118-24.

Cho, Y.H., and George H. Frederickson. 1973. *Determinants of public policy in the American states: A model for synthesis*. Beverly Hills: Sage Professional Paper.

Citizen Conference on State Legislatures (CCSL). 1971. *State legislatures: An evaluation of their effectiveness.* New York: Praeger.

Clarke, S. 1979. Determinants of state growth management policies. *Policy Studies Journal* 7: 753-762.

Clucas, Richard A. 1994. The first post-term-limits election in California. In *Extension of remarks*, ed. Larence C. Dodd, Washington D.C.: Legislative Studies Section of the American Political Science Association.

Coburn, Randy and Dolan Garrett. 1995. Industry / government partnership works to solve New York environmental issues *Pulp and Paper.* 69, no. 10 (October): 59-63.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Communication Channels Inc. 1994. *Waste-to-energy in the United States: Socioeconomic factors and the decision-making process.* Golden, Colo.: National Renewable Energy Laboratory.

Craggs, Robert. 1995. Regionalization: A solid waste solution. *American City and County.* 110, no. 9 (August): 44-46.

Crotty, Patricia McGee. 1987. The new federalism game: Primary implementation of environmental policy *Publius: The Journal of Federalism* 17 (Spring): 53-67.

Cummings, Leslie, Edwards. 1990. Indicator models for state solid waste management policies. Ph.D. Dissertation. Arizona State University.

Darcey, Sue. 1992. Coping with the landfill crisis, *World Wastes.* 35, no.5 (May); 26-34.

Davis, Charles E., and James P. Lester. 1989. Federalism and environmental policy. In *Environmental politics and policy: Theories and evidence*, ed. James P. Lester. Durham, NC: Duke University Press.

Dawson, Richard E., and James Robinson. 1963. Inter-party competition, economic variables, and welfare policies in the American states. *Journal of Politics* 25: 285-89.

Denison, Richard A., and John Ruston. 1990. Introduction. In *Recycling and incineration: Evaluating the choices,* eds. Denison, Richard A., and John Ruston. Washington D.C.: Island Press.

Denison, Richard A., and John F. Ruston. 1997. Recycling is not garbage. *Technology Review.* 100, no.7 (October): 55-60.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

De Young, Raymond. 1986. Some psychological aspects of recycling: The structure of conservation satisfaction. *Environment and Behavior* 18 (July): 435-86.

De Young, Raymond. 1990. Recycling as appropriate behavior: a review of survey data from selected recycling education programs in Michigan. *Resources, Conservation, and Recycling* 3: 241-252.

Downs, Anthony. 1957. *An economic theory of democracy*. New York: Harper.

Downs, George W., Jr. 1976. *Bureaucracy, innovation, and public policy*. Lexington, Mass.: Lexington Books.

Dunlap, Riley E., and Michael P. Allen. 1976. Partisan differences on environmental issues: A congressional roll-call analysis. *Western Political Quarterly* 29, no. 3 (September): 384-397.

Dye, Thomas R. 1966. *Politics, economics and the public policy: Policy outcomes in the American states*. Chicago, Ill.: Rand McNally.

--------- 1971. State legislative politics. In *Politics in the American States: A comparative analysis, second edition*, eds. Herbert Jacob and Kenneth N. Vines, 163-209. Boston: Little, Brown.

--------- 1979. Politics versus economics: The development of literature on policy determinism. *Policy Studies Journal* 7: 652-662.

Edelman, Murray. 1988. *Constructing the political spectacle*. Chicago, Ill.: The University of Chicago Press.

Edwards III, George C. 1980. *Implementing public policy*. Washington D.C.: Congressional Quarterly Press.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Elazar, Daniel J. 1972. *American Federalism: A view from the states, second edition.* New York: Crowell.

Erikson, Robert S., Gerald C. Wright Jr., and John P. McIver. 1989. Political parties, public opinion, and state policy in the United States. *American Political Science Review* 83, no.3 (September): 729-50.

--------- 1993. *Statehouse democracy: Public opinion and policy in the American states.* New York: Cambridge University Press.

Ervin, C. 1991. Source reduction: Getting beyond the rhetoric. *Pollution Prevention Review*, 1: 107-18.

Everett, J.W. 1989. Residential recycling programs: Environmental, economic and disposal factors. *Waste Management and Research* 7: 143-52.

Federal Register. 1988. 53 (August 30): 33366.

Federal Register. 1991. 56, 104 (May 30): 24468-24528.

Feiock, Richard C., and Jonathan P. West. 1993. Testing competing explanations for policy adoption: Municipal solid waste recycling programs. *Political Research Quarterly* 46, no.2 (June): 399-419.

Finegan, Jay. 1990. Anatomy of a start-up: Down in the dump. *Inc.* 12, no.9 (September): 90-100.

Folz, David H. 1991. Recycling program design, management and participation: A national survey of municipal experience. *Public Administration Review* 51, no. 3 (May/June): 222-31.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

--------- 1995. The economics of municipal recycling: A preliminary analysis. *Public Administration Quarterly* (Fall): 299-320.

Folz, David H., and Joseph M. Hazlett. 1991. Public participation and recycling performance: Explaining program success. *Public Administration Review* 51, no. 6 (November / December): 526-32.

Fowler, Edmund P., and Robert L. Lineberry. 1975. Comparative policy analysis and the problem of reciprocal causation. In *Comparative Public Policy: Issues, Theories, and Methods*, eds. Craig Liske, William Loehr, and John McCamant. New York: Sage Publications.

Francis, John G. and Clive S. Thomas. 1991. Influences in western political culture. In *Politics and public policy in the contemporary American West*, ed. Clive S. Thomas, 23-53. Albuquerque, NM: University of New Mexico Press.

Franke, Randall. 1992. Recycling laws may tie hands. *American City and County*, 107, no. 6 (May): 18.

Futornick, Kathi. 1995. Government and industry programs for reducing pollution. In *Pollution Prevention Handbook*, ed. Thomas E. Higgins. Boca Raton, FL: Lewis Publishers.

Game, Kingsley W. 1979. Controlling air pollution: Why some states try harder? *Policy Studies Journal* 9: 404-414.

Garreau, Joel. 1981. *The nine nations of North America*. Boston, Mass.: Houghton Mifflin.

General Accounting Office, United States. 1995. *Municipal solid waste flow control: Summary of public comments*. Washington D.C.: USEPA.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Glenn, Jim. 1990. The state of garbage in America. Biocycle (March): 48-55.

Glenn, Jim, and D. Ridge. 1991. The state of garbage in America. *Biocycle.* (April): 34-38.

Goddard, H. 1995. The benefits of costs and alternative solid waste disposal policies. *Resources, Conservation, and Recycling* 13: 183-213.

Godwin, R. Kenneth, and W. Bruce Shepard. 1976. Political process and public expenditures: A re-examination based on theories of representative government.

Goldsteen, Joel B. 1993. *Danger all around: Waste storage crisis on the Texas and Louisiana Gulf Coast.* Austin, TX: University of Texas Press.

Goldstein, Nora and Jim Glenn. 1997. The state of garbage in America, part II. *Biocycle* 38, no.5 (May): 71-75.

Gomez-Ibanez, J.A.; J.R. Meyer, D.E. Luberoff. 1992. Solid waste disposal: Public and private. *Chemtech.* 72, no. 2: 78-85.

Gray, Virginia. 1973. Innovation in the states: A diffusion study. *American Political Science Review* 67, no.4: 1174-85.

Gray, Virginia and David Lowery. 1995. Interest representation and democratic gridlock. *Legislative Studies Quarterly* 20, no.4 (November): 531-52.

Grumn, John. 1971. The effects of legislative structure on legislative performance. In *State and Urban Politics: Readings in Comparative Public Policy,* eds. Richard I. Hofferbert and Ira Sharkansky. Boston: Little & Brown.

Guerra, S. 1992. Markets for recyclables: The challenge for local government recycling programs. *ICMA, Municipal Year Book 1992.* Washington D.C.: ICMA.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Hall, Bob, and Marry Lee Knerr. 1991. *The green index: A state by state guide to the nation's environmental health.* Washington D.C.: Island Press.

Harrigan, John J. 1994. *Politics and policy in states and communities, fifth edition.* New York, NY: Harper Collins College Publishers.

Hays, Scott P., Michael Esler, and Carol E. Hays. 1996. Environmental commitment among the states: Integrating alternative approaches to state environmental policy. *Publius: The Journal of Federalism* 26, no.2 (Spring): 41-58.

Hedge, David M., and Michael J. Scicchinato. 1993. The states and environmental regulation in the 1980s: A test of the new federalism. In *State Policy Problems*, eds. Fred A. Meyer and Ralph Baker. Chicago: Nelson-Hall.

Heing, Jeffrey. 1985. *Public policy and federalism.* New York: St. Martin's Press.

Hird, John A. 1991. The political economy of pork: Project selection at the U.S. Army Corps of Engineers. *American Political Science Review* (June): 429-56.

--------- 1994. *Superfund: The political economy of environmental risk.* Baltimore: John Hopkins University Press.

Hockett, Daniel; Douglas J. Lober, and Keith Pilgrim. 1995. Determinants of per capita municipal solid waste generation in the Southeastern United States. *Journal of Environmental Management* 45: 205-17.

Hofferbert, Richard I. 1974. *The study of public policy.* Indianapolis: Bobbs-Merrill.

Hofferbert, Richard I., and J. Urice. 1985. Small scale policy: The federal stimulus versus competing explanations for state funding for the arts. *American Journal of Political Science* 29: 308-29.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Holbrook-Provov, Thomas M., and Steven C. Poe. 1987. Measuring state political ideology. *American Politics Quarterly* 15, no.3 (July): 399-416.

Huhtala, Anni. 1997. A post-consumer waste management model for determining optimal levels of recycling and landfilling. *Environmental and Resource Economics* 10: 301-14.

Illinois Environmental Protection Agency, Division of Pollution Control. 1996. *Available disposal capacity for solid waste in Illinois: Ninth annual report.* Springfield, Ill.: Illinois Environmental Protection Agency.

Information Plus. 1994. *Garbage and other pollution.* Wylie, TX: Information Plus.

Inglehart, Ronald. 1977. *The silent revolution: Changing values and political styles among western publics.* Princeton, NJ: Princeton University Press.

--------- 1988. The Renaissance of political culture. *American Political Science Review* 82, no. 4 (December): 1203-30.

Ingram, Helen, Nancy Laney, and John R. McClain. 1979. Water scarcity and the politics of plenty in the four corner states. *Western Political Quarterly* 32, no.3 (September): 298-306.

Jackson, Robert A. 1992. Effects of public opinion and political system characteristics on state policy outputs. *Publius: The Journal of Federalism* 22 (Fall): 31-46.

Jones, Charles O. 1976. Regulating the environment. In *Politics in the American States,* ed. Herbert Jacobs and Kenneth Vines. Boston: Little, Brown.

Kahle, Lynn R. 1986. The nine nations of North America and the value basis of geographic segmentation. *Journal of Marketing* 50 (April): 37-47.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Kalt, Joseph and M.A. Zupan. 1984. Capture and ideology in the economic theory of politics. *American Economic Review* 74: 279-300.

Kharbanda, Om Prakash, and E.A. Stallworthy. 1990. *Waste management: Towards a sustainable society.* New York: Auburn House.

Khator, Renu. 1993. Recycling: A policy dilemma for American states? *Policy Studies Journal* 21, no.2: 210-26.

Kimball, Debi. 1992. *Recycling in America: A reference handbook.* Santa Barbara, CA: ABC-CLIO.

Kincaid, John. 1982. Introduction. In *Political culture, public policy and the American States,* Ed. John Kincaid. Philadelphia: Institute for the Study of Human Issues.

Klingman, David & William W. Lammers. 1984. The general policy liberalism factor in American state politics. *American Journal of Political Science* 28: 598-610.

Kovacs, William L. 1986. Legislation and involved agencies. In *The solid waste handbook: A practical guide,* ed. William D. Robinson, 9-30. New York: John Wiley & Sons.

--------- 1993. Solid waste management: Historical and future perspectives. *Resources, Conservation, and Recycling* 8, no.1-2 (January): 113-130.

Kreith, Frank. 1994. Introduction. In. *Handbook of solid waste management.* ed. Frank Kreith, 1.1-1.24. New York: McGraw-Hill, Inc.

Kurtz, Karl. T. 1990. The changing state legislatures (lobbyists beware). In *Leveraging state government relations*, ed. Wesley Pedersen. Washington D.C.: Public Affairs Council.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Ladd, A.E.; S. Laska. 1991. Opposition to solid waste incineration: Pre-implementation anxieties surrounding a new environmental controversy. *Social Inquiry* 61, no.3: 701-16.

Lawrence, Carol M, and Inder K. Khurana. 1997. Superfund liabilities and governmental reporting entities: An empirical analysis. *Journal of Accounting and Public Policy.* 16, no.2 (Summer): 155-186.

Lehr, Jay H. 1991. South Dakota is the answer, what is the question? *Ground Water* 29, no.3 (May-June): 322-26.

Lester, James P. 1980. Partisanship and environmental policy: Mediating influence of state organizational structures. *Environment and Behavior* 12 (March): 101-31.

--------- 1990: A New federalism? Environmental policy in the states. In *Environmental policy in the 1990s,* Norman J. Vig, and Michael E. Kraft. Washington D.C.: Congressional Quarterly Press.

--------- 1994. Comparative state environmental politics and policy: The evolution of a literature. *Policy Studies Journal* 22, no.4 (Winter): 696-700.

Lester James P., James L. Franke, Anne O'M Bowman, and Kenneth W. Kramer. 1983. Hazardous waste politics and public policy: A comparative state analysis. *Western Political Quarterly* 36, no.2 (June): 258-85.

Lester, J. Franke & P. Keptner. 1984. State budgetary commitments to environmental quality under austerity. In *Western public lands,* ed. J. Francis & R. Ganzel. Totowa, NJ: Towan and Allenheld.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Lester, J. Franke, and Emmett N. Lombard. 1990. The comparative analysis of state environmental policy. *Natural Resources Journal* 30, no.2 (Spring): 301-21.

Lewis-Beck, Michael. 1977. The relative importance of socio-economic and political variables for public policy. *American Political Science Review* 71: 559-66.

Lewis-Beck, Michael, and John Alford. 1980. Can government regulate safety? The coal mine example. *American Political Science Review* 74, no.3: 745-56.

Lineberry, Robert L. 1977. *American public policy: What government does and what difference it makes?* New York: Harper & Row.

Lober, Douglas J. 1996. Municipal solid waste policy and public participation in household source reduction. *Waste Management & Research* 14: 125- 43.

Lodge, George C. Kaypart Jeffrey R. 1991. Knee-deep and rising: American recycling crisis. *Harvard Business Review.* 69, no.5 (September / October): 128-139.

Lombard, Emmett N. 1993. Determinants of state air-quality management: A comparative analysis. *American Review of Public Administration* 3, no.1 (March): 57-73.

Lowry, William R. 1992. *The Dimensions of federalism: state governments and pollution control policies.* Durham, NC: Duke University Press.

Lund, Herbert F. 1993. *The Mc-Graw-Hill recycling handbook.* New York: McGraw-Hill.

Mahajam, Vijay, and Manej Agarwal. 1975. Environment and public policy in the United States: A diffusion analysis. In *Environmental assessment of socioeconomic systems*, ed. Dietrich F. Burkhardt and William H. Ittelson.. New York: Plenum Press.

Mazmanian, Daniel, and Paul Sabatier. 1989. *Implementation and public policy.* New York: University Press of America.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

McClain, Katherine T. 1995. Recycling programs. In *Handbook of environmental economics, Reprinted*, ed. Daniel W. Bromley, 222-239. Cambridge, MA: Basil Blackwell Ltd.

Melosi, Martin V. 1981. *Garbage in the cities: Refuse, reform, and the environment: 1880-1980.* College Station, TX: Texas A&M University Press.

Mishkin, A. E. 1989. What does "the hierarchy" dictate? *Waste Age* (December): 141- 42.

Morgan, David R., and Sheilah S. Watson. 1991. Political culture, political system characteristics, and public policies among the American states. *Publius: The Journal of Federalism* 21 (Spring): 31-49.

Morgan Quitno Corporation. 1995. *State Rankings.* Lawrence, KS: Morgan Quitno Corp.

Murphy, Pamela. 1993. *The garbage primer.* New York: Lyons & Burford; League of Women Voters of the United States.

New York Times. 1988. Hauling costs soaring, Jerseyans turn to dumping trash illegally. *New York Times* March 18: A1, B2.

Office of Technology Assessment (OTA). 1992. *Facing America's trash: What next for municipal solid waste?* Reprint. (Originally published: Washington D.C.: Congress of the United States, Office of Technology Assessment, 1989) New York, NY: Van Nostrand Reinhold.

Ohlsen, Michael. 1996. Florida recycling markets gets back to business. *World Wastes* 39, no.9 (September): 37-42.

Okere, Lawrence N. 1995. Hazardous waste policy: A comparative analysis of states' enforcement effort . Ph.D. Dissertation. University of North Texas.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Page, Benjamin I., and Robert Y. Shapiro. 1983. Effect of public opinion on policy. *The American Political Science Review* 77: 175-95.

Passell, P. 1991. The garbage problem: It may be politics, not nature. *The New York Times* 26 (February): C1

Rabe, Barry G. 1994. *Beyond NIMBY: Hazardous waste siting in Canada and the United States*. Washington D.C.: The Brookings Institution.

Rasmussen, Thomas H. 1992. Not in my backyard: The politics of siting prisons, landfills, and incinerators. *State and Local Government Review* (Fall): 128-34.

Rathje, William, and Cullen Murphy. 1992. Five major myths about garbage, and why they're wrong. *Smithsonian* 23, no.4: 113-22.

Raymond Communications. 1996. *State recycling laws update: Year-end edition, 1996* Riverdale, MD: Raymond Communications, Inc.

Reese, Craig E. 1983. *Deregulation and environmental quality: The use of tax policy to control pollution in North America and Western Europe.* Westport, Connecticut: Quorum Books.

Regens, James L., and Reams, Margaret A. 1988. State strategies for regulating groundwater quality. *Social Science Quarterly* 53-69.

Repa, Edward W., and Allen Blakey. 1996. Waste disposal trends. *Waste Age* (January): 43-54.

Rhyner, Charles R., Leander J. Schwartz, Robert B. Wegner, Marry G. Kohrell. 1995. *Waste management and resource recovery.* Boca Raton, FL: Lewis Publishers.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Ringquist, Evan J. 1993a. Testing theories of state policy-making: The case of air quality regulation. *American Politics Quarterly* 21, no.3 (July): 320-42.

--------- 1993b. *Environmental protection at the state level: Politics and progress in controlling pollution.* Armonk, NY: M.E. Sharpe.

--------- 1993c. Does regulation matter?: Evaluating the effects of state air pollution control programs. *Journal of Politics* 55, no.4 (November): 1022-45.

--------- 1994. Policy influence and policy responsiveness in state pollution control. *Policy Studies Journal* 22, no.1: 25-43.

Robey, John S., and Hassan Tajalli. 1988. Politics, economics, and policy responsiveness in the American states. *State and Local Government Review.* 20, no.2 (Spring): 59-63.

Rogoff, March J., and John F. Williams. 1995. Finding funds to fuel recycling. *World Wastes* 38, no.7 (July): 66-71.

Rose, Douglas D. 1973. National and local forces in state politics: The implications of multi-level policy analysis. *American Political Science Review* 67: 1162-73.

--------- 1975. Citizen preference and public policy in the American states: A causal analysis of nondemocracy. In *Perspective on public policymaking,* eds. William B. Gwyn and George C. Edwards III, 53-94. New Orleans: Tulane University.

Rosenstone, J. A. 1983. *Forecasting presidential elections.* New Hawen, CT: Yale University Press.

Rosenthall, Alan. 1996. State legislative development: Observations from three perspectives. *Legislative Studies Quarterly* 21, no.2 (May): 169-98.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Rourke, Francis E. 1984. *Bureaucracy, politics, and public policy, third edition.* Boston: Little, Brown.

Sabatier, Paul A. 1977. Regulatory policymaking: Toward a framework of analysis. *Natural Resources Journal* 17: 415-60.

Saffell, David C. 1982. *State and local government: Politics and public policies. Second edition.* Reading, Mass.: Addison-Wesley Publishing.

Salisbury, R. 1968. The analysis of public policy: The case of air quality. *American Politics Quarterly* 21: 320-42.

Savage, Robert L. 1978. Policy innovation as a trait of American states. *Journal of Politics* 40 (February): 212-14.

Savage, Robert L. 1985. When a policy's time has come: Cases of rapid policy diffusion: 1983-84. *Publius* 5, no.3: 111-25.

Schroeder, Joan V. 1989. Northern Trash. *New York Times*, 16 (August): op-ed page.

Schweich, S.L. 1992. The solid waste industry: 1992 review and 1993 outlook. *Waste Age* 23, no.12 (December): 47,50,52,54,56-57.

Selke, S.E.M. 1990. *Packaging and the environment: alternatives, trends, and solutions.* Lancaster, PA: Technomic Publishing Company.

Shapard, Rab. 1997. Trash, cash and landfill gas remain part of the debate, *American City and County*. 112, no.5 (May): 24-26.

Sharkansky, Ira. 1975. The utility of Elazar's political culture: A research note. *The American Cultural Matrix*, In eds. Daniel Elazar and Joseph Zikmund II. New York, NY: Thomas Y. Crowell.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

SRI International. 1992. *Data summary of municipal solid waste management alternatives, Volume I: Report text.* Golden, Colorado: National Renewable Energy Laboratory.

Squire, Peverill. 1992. Legislative professionalization and membership diversity in state legislatures. *Legislative Studies Quarterly* 17, no.1 (February): 69-79.

Starkey, Deb and Kelly Hill. 1996. *A Legislator's Guide to Municipal Solid Waste Management.* Washington D.C.: National Conference of State Legislatures.

State Policy Research. 1989. *State policy data book, 1989.* Arlington, VA: State Policy Research Inc.

Steuteville, Robert. 1992. Economic development in the recycling arena. *Biocycle* 33, no.8: 40-44.

--------- 1994a. Year end review of recycling. *Biocycle* 35, no.12 (December): 30-32.

--------- 1994b. The state of garbage in America, part I. *Biocycle* 35, no.4 (April): 46-52.

--------- 1995. The state of garbage in America, part I. *Biocycle* 36, 4 (April): 54-63.

Steuteville, Robert, Nora Goldstein, and Kurt Grotz. 1993. The state of garbage in America, part II. *Biocycle*. 34, no.6 (June): 32-37.

Texas Center for Policy Studies. 1995. *Texas environmental almanac*. Austin, TX: Texas Center for Policy Studies.

Tennes, Ann E. 1995. Regional agency signs 20-year transfer contract. *World Wastes*. 38, no.12: 14.

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Thomas, Clive S. 1991. Conclusion: continuity, change and future directions in Western politics and public policy. In *Politics and public policy in the contemporary American West,* ed. Clive S. Thomas, 499-528. Albuquerque, NM: University of New Mexico Press.

Thomas Clive S., and Ronald J. Hrebenar. 1990. Interest groups in the states. In *Politics in the American States, fifth edition.* eds. Virginia Gray, Herbert Jacob, and Robert Albirtton. Glenview, IL: Scott, Foresman.

USEPA. 1971. *Closing open dumps.* Washington D.C.: USEPA, Office of Solid Waste.

--------- 1973. *An environmental assessment of gas and leachate problems at land disposal sites.* Washington D.C.: USEPA, Office of Solid Waste. EPA 530/SW-110-OF

--------- 1986. *Census of state and territorial subtitle D non-hazardous waste programs.* Washington D.C.: Office of Solid Waste and Emergency Response.

--------- 1988. *Report to Congress: Solid waste disposal in the United States.* Washington D.C.: US Printing Office. EPA/530-SW-88-011.

--------- 1989. *The solid waste dilemma: An agenda for action.* Washington D.C.: USEPA

--------- 1992. *Characterization of municipal solid waste in the United States: 1992 update.* Washington D.C.: USEPA. EPA/530-R-92-019.

--------- 1995. *Characterization of municipal solid waste in the United States: 1994 update.* Washington D.C.: USEPA.

--------- 1996. *Characterization of municipal solid waste in the United States: 1995 update.* Washington D.C.: USEPA. EPA/530-R-945-001.

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Van Voorst, Bruce and James O. Jackson. 1993. Recycling: stalled at curbside. *Time* 142 no.16 (October 18): 78-80.

Van Tassel, Alfred J. 1973. *Our environment: The outlook of 1980.* Lexington, Mass.: Lexington Books.

Walker, Jack L. 1969. The diffusion of innovation among the American states. *American Political Science Review* 63: 880-99.

Warren, Charles. 1982. State government's capacity: Continuing to improve. *National Civic Review* 71, no.5: 34-39.

Wassenberg, Pinky S. 1986. State response to reductions in federal funds: Section 106 of the federal water pollution control Act amendments of 1972. In *Administering the New Federalism*, eds. Lewis G. Bender and James A. Stever. Boulder, CO: Westview Press.

Waters, Larry. 1993. Waste not, want not. American city and county. 108, 7 (June): 38,42.

Weber, Ronald E., and William R. Shaffer. 1972. Public opinion and American state policy making. *Midwest Journal of Political Science* 16: 633-99.

Weber, Ronald E., Anne H. Hopkins, Michael L. Mezey, and Frank Munger. 1972. Computer simulation of state electorates. *Public Opinion Quarterly* 36: 49-65.

Wenner, Lettie M. 1976. *One environment under law: A public policy dilemma.* Pacific Palisades: Goodyear Publishing Company.

White, P.T. 1983. The fascinating world of trash. *National Geographic* 30, no.4 (October): 45-50.

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Williams, Bruce A., and Albert R. Matheny. 1984. Testing theories of social regulation: Hazardous waste regulation in the American states. *Journal of Politics* 46: 428-58.

Williams, Marcia E. 1994. Integrated municipal solid waste management. In *Handbook of Solid Waste Management*, ed. Frank Kreith , 2.1-2.16. New York: Mc-Graw-Hill, Inc.

Wilt, Catherina A., and Garry A Davis. 1996. Local control wasting away: Will Congress level the solid waste playing field? *Policy Studies Journal* 24, no.1 (Spring): 123- 34.

Wiseman, Clark. 1991. Dumping: Less wasteful than recycling. *Wall Street Journal* (July 18): A10.

Wright, Gerald C.; Robert S. Erikson, and John P. McIver. 1985. Measuring state partisanship and ideology with survey data. *Journal of Politics* 47: 469-89.

--------- 1987. Public opinion and policy liberalism in the American states. *American Journal of Political Science* 31: 980-1001.

Yoon, Young-Chai. 1994. Integrated solid waste management: Toward a recycling model. Ph.D. Dissertation, Boca Raton, FL: Florida Atlantic University.

Young, John E. 1995. The sudden new strength of recycling. *World Watch* 8 (July-August): 20-25.

Ziegler, L. Harmon. 1983. Interest groups in states. In *Politics in the American States. Fourth edition*, eds. Virginia Gray, Herbert Jacob, and Kenneth N. Vines. Boston: Little, Brown.

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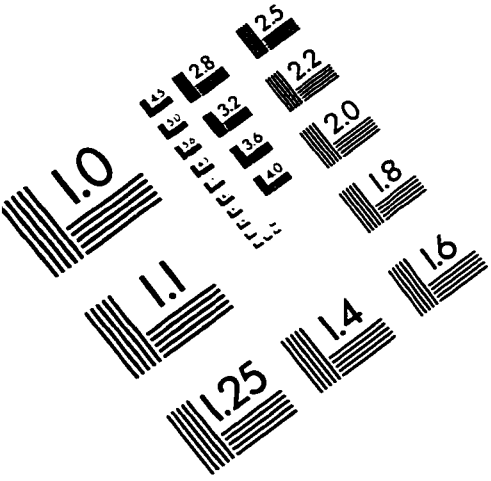
## BIOGRAPHICAL INFORMATION

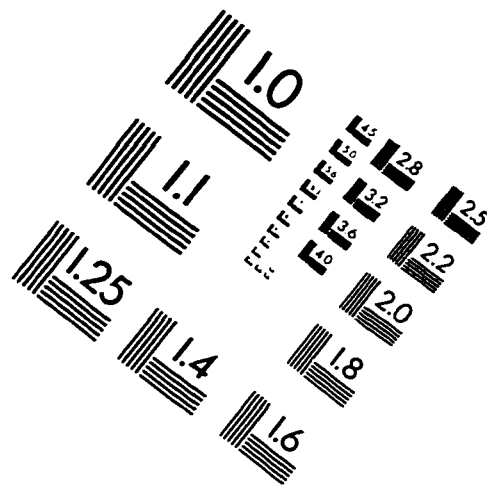
Huseyin Ozgur was born in Izmir, Turkey in 1966. He received his B.A. and M.A. degrees in Public Administration (with emphasis in Political Science) from Dokuz Eylul University; Izmir, Turkey (1987 and 1992). Huseyin Ozgur's career began as a research assistant in Department of Public Administration, Dokuz Eylul University in 1990. Starting in late 1993, he was a research assistant in Department of Public Administration, Adnan Menderes University, Nazilli, Turkey. Ozgur was awarded a scholarship (nationwide examination) in 1993 to pursue his Doctor of Philosophy degree in Public Administration abroad. Before attending The University of Texas at Arlington, he completed intensive english courses in Izmir, Turkey and Austin, Texas. He completed his second master degree (Master of Public Administration) in the School of Urban and Public Affairs, The University of Texas at Arlington in 1996.

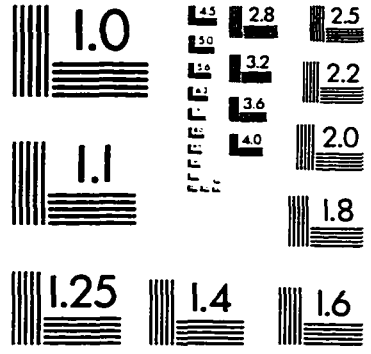
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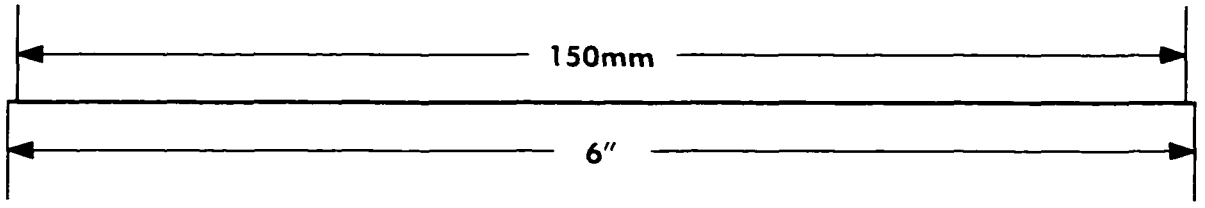
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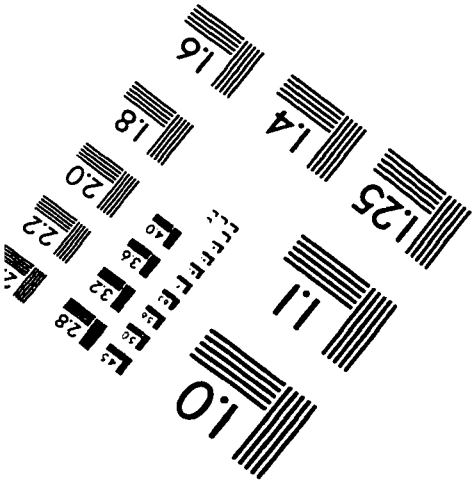
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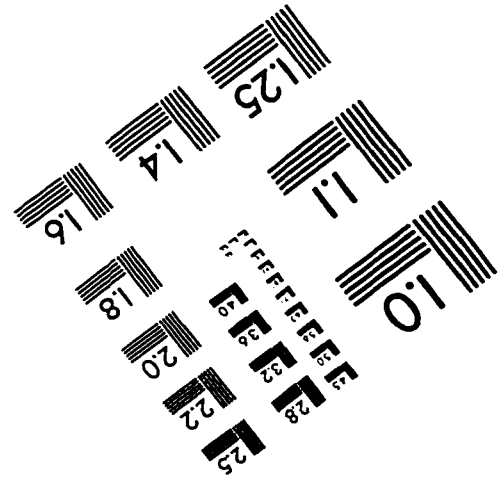



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