

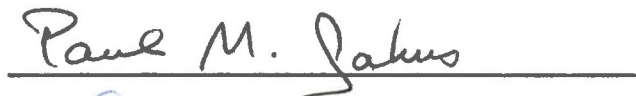
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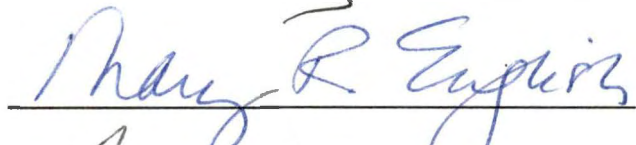
I am submitting herewith a dissertation written by Kelly Jo Tiller entitled "Multijurisdictional Cooperation in Municipal Solid Waste Management." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Agricultural Economics.

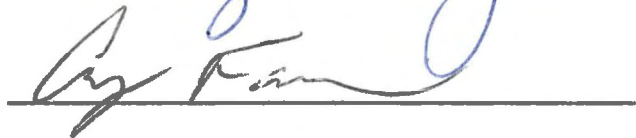

William M. Park, Major Professor

We have read this thesis
and recommend its acceptance:











Accepted for the Council:


Associate Vice Chancellor
and Dean of the Graduate School

**MULTIJURISDICTIONAL COOPERATION IN
MUNICIPAL SOLID WASTE MANAGEMENT**

A Dissertation

Presented for the

Doctor of Philosophy

Degree

The University of Tennessee, Knoxville

Kelly Jo Tiller

December 1996

AD-VET-MED.

Thesis
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ACKNOWLEDGMENTS

I would like to express appreciation to the faculty, staff, and students of the Department of Agricultural Economics and Rural Sociology for making my time at the University of Tennessee so rewarding. I am particularly grateful to my Major Professor, William Park, and to my Dissertation Committee members, Paul Jakus, Mary English, Amy Farmer, Frank Leuthold, and Roland Roberts. They have read a number of revisions of the dissertation and the merit of this work is due in no small part to their suggestions.

I am very grateful for the generous financial support I have received from the Department of Agricultural Economics and the Waste Management Research and Education Institute.

My most sincere appreciation is owed to my husband, Todd, and to my family. Without their encouragement, patience, and understanding I would not have been able to achieve this endeavor.

ABSTRACT

This study examines the decision of local governments to conduct municipal solid waste (MSW) planning and management independently or cooperatively. First, the research develops a theoretical framework in which the decision process of local governments may be examined, drawing upon economic theory as well as other social science disciplines. According to the theoretical model developed, a governmental unit first selects optimal levels of choice characteristics, conditioned upon own characteristics, that maximize utility. The unit then compares the resulting optimal utility to utility levels achievable with alternative feasible arrangements for provision of MSW planning and management, to select the feasible arrangement that minimizes the difference from optimal utility. If the optimal feasible strategy involves multijurisdictional cooperation and the same outcome is not selected as optimal by all potential cooperating partners, then the unit must engage in a negotiation process to achieve an outcome that maximizes utility of all participants simultaneously.

This theory is then examined using data from Tennessee, where recent legislation required all counties to form either a single or multi-county

solid waste region. The legislation also established a minimum service level for MSW services, and required all regions to develop a comprehensive plan for meeting minimum service level restrictions.

First, regionalization decisions and the resulting management of MSW are examined through five in-depth case studies of solid waste regions in Tennessee. Results of the case studies indicate that cooperation in the management of MSW is facilitated when potential operational cost savings due to economies of scale in disposal are not only available, but also effectively communicated and widely accepted. Cooperation is also facilitated by a reduction in transaction costs which can be achieved through past cooperative efforts, presence of a cooperation entrepreneur, institutional arrangements that serve as a cooperation cornerstone, the type of bond creating the region, and some private sector influences. Other factors that heavily influence decisions and outcomes are the autonomy risk and political risk associated (or perceived to be associated) with cooperation. Finally, the degree to which a service level constraint or budget constraint is binding influences cooperation decisions.

The theory and case studies then contributed toward development of statistical models designed to predict the decision Tennessee counties made in 1991 regarding solid waste region formation. The models showed that

multi-county cooperation was more likely to be observed if neighboring counties had a low population, the county and its neighbors were more urban, the county had a large county commission, the county currently managed a small percentage of its generated waste, and the county did not have a Subtitle D landfill or firm plans to construct a Subtitle D landfill. The model predicted the outcome with 72% accuracy, and by far, the most significant influence on the decision was the presence of a Subtitle D landfill.

TABLE OF CONTENTS

CHAPTER	PAGE
I. INTRODUCTION	1
1. Rising Disposal Costs	2
2. Waste Reduction, Recycling, and Planning Requirements	5
3. Research Objectives	6
II. REVIEW OF LITERATURE	10
1. Exchange Theory	10
2. Club Theory	12
3. Tiebout Model	14
4. Game Theory	16
5. Negotiated Order Theory	18
6. Institutional Considerations	20
7. Other Contributions	22
III. THEORETICAL MODEL	25
1. Introduction	25
2. Utility Maximization Model	26

3.	Utility Difference Model	38
4.	Cooperation Negotiation	41
IV.	CASE STUDIES	45
1.	Introduction	45
A.	Case Study Selection	48
B.	Case Study Method	48
2.	Cocke County Solid Waste Region	50
A.	History and Background Information	50
B.	Decision Process	53
C.	Organization and Activities	57
D.	Lessons Learned	60
3.	Scott County Solid Waste Region	64
A.	History and Background Information	64
B.	Decision Process	67
C.	Organization and Activities	70
D.	Lessons Learned	74
4.	Inter-local Solid Waste Authority	77
A.	History and Background Information	77
B.	Decision Process	81
C.	Organizations and Activities	86

	D.	Lessons Learned	91
5.		Southeast Tennessee Solid Waste Region	95
	A.	History and Background Information	95
	B.	Decision Process	100
	C.	Organization and Activities	104
	D.	Lessons Learned	112
6.		Benton-Carroll-Henry Solid Waste Region	116
	A.	History and Background Information	116
	B.	Decision Process	120
	C.	Organization and Activities	122
	D.	Lessons Learned	129
V.		STATISTICAL MODELS	134
	1.	Introduction	134
	2.	Data and Hypotheses	135
		A.	Operational Costs 140
		B.	Transaction Costs 145
		C.	Autonomy 150
		D.	Political Risk 152
		E.	Minimum Service Level Constraint 155
		F.	Budget Constraint 157

3.	Estimation Results	158
A.	Binary Choice Model	158
B.	Poisson Model	166
VI.	CONCLUSIONS	170
1.	Summary of Findings	170
A.	Theoretical Model	170
B.	Case Studies	171
C.	Statistical Models	178
2.	Policy Implications	182
	REFERENCES	186
	VITA	191

LIST OF FIGURES

FIGURE	PAGE
1. Bargaining Strategies in Negotiating Cooperation Outcomes	43
2. Cocke County Solid Waste Region	51
3. Characteristics of Cocke County and Surrounding Counties	52
4. Scott County Solid Waste Region	65
5. Characteristics of Scott County and Surrounding Counties	66
6. Inter-local Solid Waste Authority	78
7. Characteristics of Counties in and Surrounding the Inter-local Solid Waste Authority	79
8. Southeast Tennessee Solid Waste Region	96
9. Characteristics of Southeast Tennessee Solid Waste Region	97
10. MSW Disposal Flows in the Southeast Tennessee Solid Waste Region	107
11. Class III/IV Disposal Flows in the Southeast Tennessee Solid Waste Region	109
12. Collection Efforts in the Southeast Tennessee Solid Waste Region	110

13.	Recyclables Collection in the Southeast Tennessee Solid	
	Waste Region	111
14.	Benton-Carroll-Henry Solid Waste Region	117
15.	Characteristics of Benton, Carroll, Henry, and Surrounding	
	Counties	118
16.	Influence of Characteristics on Final Outcome	136
17.	Economies of Scale in Average Costs of Landfill Disposal	142
18.	Lines of Communication Associated with Cooperating	
	Partners	147
19.	Predicted and Actual Solid Waste Regions In Tennessee	165

CHAPTER I

INTRODUCTION

Municipal solid waste (MSW) refers to a specific portion of the generated waste stream, primarily solid waste generated by residential, commercial, institutional, and some industrial sources. MSW includes wastes such as durable goods, nondurable goods, containers and packaging, food scraps, yard trimmings, and miscellaneous inorganic wastes. MSW does not include wastes from other sources, such as construction and demolition wastes, automobile bodies, municipal sludges, combustion ash, and industrial process wastes that might also be disposed in municipal waste landfills or incinerators. MSW does not include hazardous wastes, as defined by amendments to the Resource Conservation and Recovery Act. The largest component of MSW is paper and paperboard products (38%). Residential wastes (including wastes from multi-family dwellings) are estimated to be 55 to 65 percent of total generation, with commercial wastes ranging between 35 and 45 percent of generation (USEPA, 1994).



In 1993, the United States Environmental Protection Agency (USEPA) estimated that 207 million tons, or 4.4 pounds per person per day, of MSW were generated (USEPA, 1994). Management of MSW has traditionally been the responsibility of individual local governments. However, several factors have significantly increased the cost and complexity of MSW management, causing local governments, especially rural counties and small communities, to consider cooperating with other independent governments to jointly provide MSW management. In fact, over the last eight years, many states have implemented state planning requirements encouraging or even mandating local governments to consider forming regional cooperative efforts for MSW management. These same factors have also caused local governments to look toward private firms as an option for management of MSW. As technologies and capital requirements of managing MSW have changed, the private sector has also aggressively pursued consideration of large scale facilities to serve broader regions.

1. RISING DISPOSAL COSTS

The major catalyst for consideration of cooperative efforts in MSW management has been "Subtitle D" regulations regarding MSW landfills. While MSW management is much broader than landfill disposal, landfilling remains the primary disposal method. In 1993, 20 percent of MSW generated was recovered for recycling or composting, 13 percent was

processed at combustion facilities, and the remaining 67 percent was sent to landfills (USEPA, 1994). For most local governments, disposal costs represent a large percentage of MSW management expenditures. Subtitle D is a generic term referring to the Environmental Protection Agency (EPA) regulations for MSW landfills under Subtitle D of the Resource Conservation and Recovery Act of 1991¹. Subtitle D regulations specify criteria for the location, design, construction, operation, monitoring, closure, and post-closure monitoring of both public and private landfills. The result is expected to be safer disposal of MSW for the environment and for human health, and a significant increase in the cost of landfilling. Some estimates project the cost of landfilling will increase 400%-900% over 1991 levels by the end of the 1990's.

Most landfills have typically been small, publicly owned, low-technology, and located in rural areas. New EPA requirements for landfill design and operation require that most existing facilities be replaced or

¹ The United States Congress passed the Resource Conservation and Recovery Act (RCRA) in 1976. RCRA was amended in 1984 and the EPA was directed to develop new regulations for the disposal of non-hazardous solid waste, as described in Subtitle D of RCRA. The regulations were promulgated in October 1991 to be effective October 9, 1993. The date was later changed for smaller landfills to April 9, 1994. However, extensions and allowances for vertical expansion in an existing landfill "footprint" essentially extended the deadline for compliance to October 9, 1996. While most landfill owners/operators are anticipating unilateral compliance by October 1996, some uncertainty still exists as to potential variances that may be granted by EPA.

extensively redesigned. Most facilities that have opened since 1991 have been much larger and often located near population centers (Steuteville, 1995a). Because rural areas have less money, less managerial expertise, limited access to technology, insufficient information about solid waste management options, and less decision-making influence at the policy level than do urban areas, they are particularly challenged by the Subtitle D legislation (Malia and Morrissey, 1994). As these rural communities are forced to close landfills not compliant with Subtitle D, one option to consider is cooperation with neighboring communities in a similar situation to exploit the potential economies of scale that might be gained by jointly constructing and operating a landfill compliant with Subtitle D.

Landfills have traditionally handled nearly all collected MSW. Landfilling is still the predominant method of managing MSW, but its share has fallen from 80% in 1989 to 67% in 1994 (Steuteville, 1995a). As landfilling becomes an increasingly expensive way to dispose of MSW, other disposal alternatives are becoming economically and politically competitive and new technologies are being developed. This also contributes to the regionalization trend because many disposal alternatives such as waste to energy incineration or mixed waste composting require a large volume of waste to operate efficiently. One way to achieve a large volume is through the cooperative efforts of several individual small governmental units.

2. WASTE REDUCTION, RECYCLING, AND PLANNING REQUIREMENTS

In the late eighties and early nineties, declining disposal capacity, increasing cost of developing and operating new landfills, and increasing citizen pressure in siting new disposal facilities contributed to a "landfill crisis" mentality. High-profile images such as the floating garbage barge in the Northeast U.S. further heightened citizen perception of the landfill crisis, which was characterized by a public image that the nation was running out of space and would soon be knee-deep in garbage. In response to such pressure and in an effort to assure future disposal capacity, 44 states passed recycling laws, or adopted recycling, diversion, or waste reduction goals between 1988 and 1993 (Steuteville, 1995b)². A large volume of recyclables is generally required to make collection, processing, marketing, and transportation of materials economically feasible (Steuteville, 1995b). These volume requirements often exceed the amount collected (and often generated) by individual communities, but joint provision of some or all recycling services, especially intermediate processing and marketing, may ease some of the financial pressure of complying with new recycling or reduction requirements.

² Diversion goals generally include recycling, composting and source reduction. Waste diversion generally requires a reduction in volume from disposal facilities, usually from a baseline year.

Also in response to the landfill crisis, a number of states have passed comprehensive waste management legislation requiring development of a long-term, detailed plan for the management of MSW. As part of comprehensive waste management legislation, many states included incentives, provisions, and/or mandates for formation of solid waste planning regions to encourage small counties and communities to take advantage of potential economies of scale associated with many aspects of MSW management, including major projects such as developing state-of-the-art landfills or conducting waste characterization studies, and leverage in marketing recyclables or in intermediate processing of recyclables. Other advantages of regional cooperation that make it attractive in states with comprehensive MSW management planning requirements include greater leverage in obtaining necessary financial resources, greater flexibility in management technology options, and often environmental improvements due to the economic feasibility of state-of-the-art technologies (EPA, 1994).

3. RESEARCH OBJECTIVES

As both voluntary and mandated MSW management planning has intensified, it has become evident that relatively few local governments are actually forming multijurisdictional cooperation regions to plan for MSW management, despite significant potential economies of scale cost savings, as well as other advantages. The overall objective of this research is to

examine the decision of local governments to conduct MSW planning and management independently or cooperatively. Specific objectives of this research are:

- (1) To develop a theoretical framework in which the decision process of local governments may be examined, drawing upon economic theory as well as other social science disciplines.
- (2) To develop in-depth case studies of selected solid waste regions to examine the cooperation decision process, the outcome, and the implications for solid waste management.
- (3) To develop statistical models that examine the decision local governments made in response to state legislation requiring formation of solid waste regions.

To achieve the second and third objectives, the situation of solid waste management in Tennessee provides a rich resource through which in-depth research may be accomplished. In 1991, Tennessee enacted comprehensive solid waste management legislation that required each county in the state to develop a plan for achieving solid waste goals and requirements. As a first step in plan development, each county was required to form a solid waste region, with a single county the minimum acceptable size. Statutory language, monetary incentives, and technical advisors all encouraged counties to form multi-county regions. Tennessee's Division of Solid Waste Assistance, in the Tennessee Department of

Environment and Conservation, has made relevant data available to facilitate research and understanding of multijurisdictional cooperation in solid waste management.

The remainder of this report is structured as follows. The next chapter provides a review of literature examining alternative theoretical frameworks in which a cooperation decision may be examined. Also reviewed is research focusing on elements of the cooperation decision in the management of MSW, as well as for the provision of other services. Chapter III proposes a theoretical framework in which factors affecting the cooperation decision are identified and the cooperation decision is examined. A random utility framework allows one to examine the optimal levels of solid waste services, autonomy risk, political risk, and other goods and services that a utility maximizing county will choose. The decision making county selects desirable levels of other counties' characteristics in an effort to take advantages of potential economies of scale cost savings associated with cooperation, while balancing benefits with potential costs associated with cooperation in the form of transaction costs, autonomy risk and political risk. The theory also emphasizes the dynamic nature of cooperation, where the outcome is dependent upon interaction among individual units.

Given the complex and specific nature of cooperation in solid waste management, a logical first step is to approach the problem through analysis

of individual cases. Thus, implications of the theory are then explored through five in-depth case studies of solid waste regions formed in Tennessee in 1992. These case studies are presented in Chapter IV. Each case is analyzed with respect to cooperation in both planning and managing MSW. As a complement to this qualitative analysis, an attempt was made to test the theory through quantitative analysis. However, the only dimension of cooperation in Tennessee that can actually be statistically analyzed is that of the decision made to form a single-county or multi-county solid waste region to develop a ten-year solid waste management plan, as required by state legislation. Thus the theory and insights gained from the case studies is then applied in Chapter V to development of two statistical models designed to predict this decision by Tennessee counties. Finally, Chapter VI provides a summary of the research and links findings from the case studies and the statistical models to the theoretical model. The final chapter also discusses policy implications of this research.

CHAPTER II

REVIEW OF LITERATURE

There are a number of frameworks within economic literature, and also some complementary perspectives from other social sciences, that provide a construct for looking at decisions of communities or jurisdictional units to cooperate in the provision and/or production of goods and services. These include economic theories of clubs, game theory, and process theories of collaboration and coordination from organizational behavior and public administration. Additional perspectives may be gained through the disciplines of sociology, political science, and planning. While no single theory of cooperation has emerged that is able to capture all facets of the decision-making process for the case of waste management, aspects of each may contribute to development of a framework able to conceptualize the decision process.

1. EXCHANGE THEORY

Regional cooperation in MSW management is characterized by both benefits and costs. Thus the framework of exchange theory is perhaps the

most popular perspective on cooperative behavior. In exchange theory, cooperation is a voluntary outcome occurring when benefits exceed costs. Cooperation arises when no potential cooperative partners are made worse off through cooperation, and at least one cooperative partner is made better off, i.e., cooperation exhibits a Pareto improvement over individual provision. While this framework is quite plausible, it is not without criticism. The first major criticism is that the framework of exchange theory is so abstract that it is difficult to connect operationally to actual behavior (Weiss, 1987). There are many benefits and many costs associated with cooperation, and many of these costs and benefits are not valued directly by markets, making comparison and cost-benefit analysis difficult. In addition, it is "especially difficult to avoid the tautological conclusion that if agencies did cooperate, the reason must be that the benefits of the transaction exceeded the costs; the research task then becomes the defense of the axiom (Weiss, 1987)." A second major drawback of exchange theory lies in the static nature of cost-benefit comparisons. The only considerations in explaining cooperative behavior are static equilibrium outcomes before and after cooperation. A major contribution of social sciences outside economics is that cooperation is in fact a dynamic process (Cigler, 1992 ; Gray, 1989; Weiss, 1987). Thus we will consider less abstract economic frameworks for cooperative behavior, as well as

contributions that focus on the dynamic nature of the cooperative process from other social science disciplines.

2. CLUB THEORY

One possible economic framework in which a decision to cooperate may be cast is that of club theory. A large volume of literature exists examining and applying the economic theory of clubs, where a club is "a voluntary group deriving mutual benefit from sharing one or more of the following: production costs, the members' characteristics, or a good characterized by excludable benefits (Cornes and Sandler, 1986)." In the basic club model, a representative member's taste is represented by a utility function composed of consumption of some private good, consumption of the club good, and the club membership size. Each member attempts to maximize utility subject to a resource constraint, which depends on the level of the two goods used and the overall club membership size. Club theory provides a theoretical foundation for the study of allocative efficiency of impure public goods (Sandler and Tschirhart, 1980). Mancur Olson, Jr. was an early pioneer of club investigation, recognizing that clubs would form to exploit economies of scale and to share public goods (Olson, 1965). James Buchanan also contributed to the early development of club theory by formalizing provision and membership conditions for clubs sharing impure public goods (Buchanan, 1965). Club theory requires that the provision and

membership conditions (and toll condition, if the good is characterized by congestion) be derived simultaneously.

One may consider an individual government's decision to join s other governments to jointly develop MSW management analogous to the decision to join a "club" of size s , where the shared club good is regional MSW management. However, recall that the club model requires that provision and membership decisions be determined simultaneously. Thus, for MSW management to be considered a pure club good requires that the jurisdictional unit choose the level of provision that maximizes individual utility. Under circumstances of state-mandated minimum provision requirements (as is the case in 44 states), individual counties or communities do not choose the level of the "club good" that maximizes utility; rather minimum requirements are set forth in legislation or regulations. It is plausible to think this level of MSW management service (i.e., the level of provision of the club good) is above the utility-maximizing level a local government would choose independently, since long-term MSW planning was virtually non-existent prior to legislative mandate. Since individual governments are constrained in choosing the level of provision of the club good as applied to MSW management planning, a pure club model may be inappropriate for examining the cooperation decision of local governments in the provision of MSW management planning.

3. TIEBOUT MODEL

A variation of a club model, the Tiebout model of local provision of public goods, attempts to show how jurisdictional size of local governments could be determined by voluntary mobility decisions, or "voting with the feet" (Tiebout, 1956). The model describes a sorting of consumers into an array of suburban communities that differ according to their public good and tax combinations. Based on Miceli's (1993) application of the Tiebout model to regionalization in the provision of education, DeBoer (1995) models a county's decision to form a multi-county region to develop a solid waste management plan as a tradeoff between cost savings and loss of autonomy. Each community chooses a tax rate and level of service that will maximize individual utility subject to a budget constraint. An alternative is for a community to cooperate with another and jointly provide solid waste management. In the case of cooperation, the community no longer faces an individual budget constraint, but a joint budget constraint of the cooperating communities, which will differ in slope from that faced by a single community. If the slope of the cooperative constraint is less than the individual constraint, then the community may attain a higher level of utility. Cooperation is efficient if the slope of each community's cooperative constraint is less than the slope of their independent constraint, which allows each community to increase their utility. However, when a community joins another in provision of the service, the tax rate/service

level decision is no longer made independently, but jointly. Thus, the community trades autonomy for cost savings.

DeBoer identifies a "cooperation range" of tax rates and service levels, which is influenced by the similarity of the two communities' indifference curves. DeBoer hypothesizes that 1) communities with a higher per capita tax base are less likely to cooperate in service delivery than are communities with a lower per capita tax base, 2) the likelihood that a community will jointly provide a service is positively related to potential economies of scale cost reductions, and 3) communities with similar preferences are more likely to cooperate.

Statistical testing of the cooperation decision of Indiana counties reveals that the inverse relationship between county size and potential economies of scale encourages smaller counties to cooperate. Other factors that encourage cooperation include existing zoning restrictions, which may cause a county to feel it is retaining authority despite cooperation, and small income differences of neighboring counties, which may indicate similarity of preferences. The existence of a landfill in a county decreased the probability of cooperating to provide MSW management. While loss of autonomy and cost savings have been shown to influence the cooperation decision, a more general model would allow consideration of a broader range of factors that may influence the decision to cooperate. For example,

loss of autonomy may not be the only "cost" offsetting benefits of cooperation.

4. GAME THEORY

An alternative construct often applied to club goods is that of game theory. *N*-person game theory, developed by John von Neumann and Oskar Morgenstern (1944), provides a natural formulation of club problems (Sandler and Tschirhart, 1980). In game theory, players have an incentive to form coalitions because of the payoffs available from playing the game. In club theory, members form clubs to partake of the available benefits. The characteristic function used in game theory indicates the "total net benefit available to all potential coalitions of players and can be used in club theory with some modification (Sandler and Tschirhart, 1980)."

Generally, the cooperation decision of individual counties could be cast into a game theory framework by assuming each county is a player and is considered for all possible partitions of the population (all counties) into multiple clubs. Each "player" compares his characteristic function in all possible partitions and voluntary membership/defection occur until a core solution is achieved. "The core of an *n*-person game is the set of feasible outcomes that cannot be improved upon by any coalition of players

(Shapley, 1971).¹" Once a core solution is achieved, the solution is stable since no player will be made better off by defect, and no player will be made better off by blocking a coalition. Thus, a game theory formulation allows for a determination of the optimum number of clubs and their stability of composition.

While determination of an optimum number of stable coalitions is highly desirable, several drawbacks to empirically applying game theory must be considered. The first of these is formulation of the characteristic function. A characteristic function would have to be developed for all possible coalitions of players. Recall that the characteristic function is essentially a "net benefit" calculation, and many of the costs and benefits of cooperation are not easily quantified. Even if the characteristic functions could reasonably be calculated, the number of calculations required would make empirics difficult. As an example, if we limited coalitions to contiguous counties and one county touched four neighboring counties, that county's potential coalitions with the other four counties only number 31, and this would be only a fraction of possible coalitions involving that county. Thus to compute characteristic functions for *all* possible coalitions of almost 100 counties would be empirically cumbersome, if not impossible.

¹ The core is a less general solution than a Pareto optimum, since a partition may be Pareto optimal but not in the core, whereas a partition in the core is always Pareto optimal (Cornes and Sandler, 1986).

Despite this drawback, a further criticism results from the nature of the "players" of a cooperation game. Counties are heterogeneous, which implies formation of "mixed" clubs, as opposed to homogeneous clubs. In the case of mixed clubs, or coalitions, a solution exists only under very restrictive assumptions.

5. NEGOTIATED ORDER THEORY

The major contribution of other social sciences examining cooperation is recognition of the dynamic process nature of cooperation (other terminology included "collaboration" and "coordination"). From an organizational behavior perspective, Barbara Gray (1989) defines collaboration as a process in which those parties with a stake in the problem actively seek a mutually determined solution, with a focus on collaboration as a method. She states that the objective of collaboration is, "to create a richer, more comprehensive appreciation of the problem among the stakeholders than any one of them could construct alone (Gray, 1989)." Gray develops a theory of collaboration as a negotiated order, conceptualized as a mechanism by which a new negotiated order emerges among a set of stakeholders (Gray, 1989). The negotiated order theory downplays the notion of organizations as fixed, rather rigid systems which are highly constrained by strict rules, regulations, goals, and hierarchical chains of command. Instead, it views organizations as complex and highly

fragile social constructions of reality which are subject to the numerous temporal, spatial, and situational events occurring both internally and externally (Day and Day, 1977). Gray identifies five features critical to the collaboration process. First, the stakeholders must be interdependent, and have a give-and-take relationship. Second, solutions emerge by dealing constructively with differences. Third, joint ownership of decisions is involved. Fourth, stakeholders assume collective responsibility for the future direction of the identified domain. Finally, collaboration is an emergent process, rather than a prescribed state of organization.

Thus far, the terms *cooperation*, *coordination*, and *collaboration* have all been used interchangeably. However, from a public administration perspective, Cigler (1992) places cooperative efforts along a continuum from networks to cooperation to coordination to collaboration, where the intensity of the linkages increases as one moves up along the continuum. Networks exist primarily for information exchange, with few barriers to entry or exit, while collaboration generally involves binding commitments by a stable membership. Mulford and Rogers (1982) use coordination and cooperation to classify static patterns of interorganizational relations. Cooperation is characterized by informed trade-offs and by attempts to establish reciprocity in the absence of rules, while coordination refers to formal institutionalized relationships among existing networks of organizations (Mulford and Rogers, 1982). Since no *level* of cooperative

effort in waste management planning has been specified, we will continue to use "cooperation" as an inclusive term indicating varying degrees of cooperative effort ranging from networking to collaboration.

Cigler also identifies pre-conditions for forming rural partnerships including 1) a catalyst, such as a disaster occurrence, 2) fiscal stress, or the perception of, by decision-makers, 3) the presence of a political constituency for cooperation, or the perception of, 4) supportive programs provided by external agents, 5) early and continued support of local elected officials, 6) visible demonstration that the cooperation has advantages, 7) the emergence of a policy entrepreneur(s), 8) an early focus on visible, effective strategies, and 9) an emphasis on collaborative skills-building by/for those involved. In addition, she identifies a number of factors that may impede the emergence of rural partnerships. These can be generally summarized as lack of various things such as leadership, citizen support, administrative and technical capacity, priority for action, clear understanding of alternatives, and clear understanding of associated costs and benefits. Other factors include dissimilarity between preferences and fiscal situations, and uncertainty of outcomes.

6. INSTITUTIONAL CONSIDERATIONS

When considering such complex governmental decisions, it is important to bear in mind the effect of the existing institutional structure on

the decision process and ultimate decision. Thus, another perspective on cooperation may be gained from political science through the theory of institutionalism. Elinor Ostrom has defined "institutions" as, "the sets of working rules that are used to determine who is eligible to make decisions in some arena, what actions are allowed or constrained, what aggregation rules will be used, what procedures must be followed, what information must or must not be provided, and what payoffs will be assigned to individuals dependent on their actions (Ostrom, 1989)." Institutionalists are interested in how rules affect patterns of interaction among people and how people build rule configurations (institutions) that are adapted to problematic situations (Oakerson, 1990). Patterns of social interaction (or in this case, patterns of governmental cooperation) occur in the context of institutional constraints and opportunities as well as in the context of physical and technical constraints and opportunities. Ultimately, the cooperation decision is limited by, or allowed up to the level of institutional capacity, or the ability to act collectively.

Institutional analysis focuses upon the creation and modification of institutions and conditions that are conducive to or facilitative of institutional innovation and adaptation. Existing institutions facilitate or inhibit the formation of new or modified institutions. Institutional analysis involves examination of the way in which (1) the nature of the resource base together with (2) constitutive institutions (policy regimes - rules used by

policy makers to enable and constrain public entrepreneurs in forming operational arrangements) affect (3) patterns of interaction among public entrepreneurs who create (4) operational institutions. The contribution of examination of institutional arrangements to cooperative decisions may be summarized by Coleman: "An institutionally rich environment is more likely to be rich in social capital, established relations of trust and reciprocity, which reduces transaction costs, and rich in public entrepreneurship, which implies a willingness to accept the risk of assuming the reasonable short-term costs of working out productive long-term relationships (Coleman, 1987).

7. OTHER CONTRIBUTIONS

Another contribution of political science is the theory of rational choice. Norms and values play a role in influencing potential cooperation. Norms are expectations about action - one's own action, that of others, or both- which express what action is right or what action is wrong (Oakerson, 1990). In rational choice theory, norms constitute constraints within which choices are made, and are little different from other constraints. Rational choice theory treats social norms as supra-individual entities that affect the costs and benefits which individuals (in this case, governments) take into account when exercising choice (Oakerson, 1990).

In addition to major contributions of theoretical developments and cooperation process contributions, a number of other studies have been conducted in the area of waste management, as well as in the provision and/or production of other services, that may provide insight into factors that affect the cooperation decision process. In a presentation of findings associated with an ongoing national study of multi-community cooperation in MSW management, William Park identified twelve factors associated with progress toward cooperation. These include 1) a bottom-up initiative with state and/or regional facilitation; 2) homogeneity among participants; 3) previous success with cooperation in another area or early small success on MSW matters; 4) clearly defined and widely accepted potential benefits; 5) time and flexibility to let process move at own speed and along own course; 6) neutral, respected, and effective third-party "broker"; 7) perception of equitable board representation; 8) ability of board to deal timely, openly, and fairly with conflicts; 9) effective public education and participation with respect to sensitive issues; 10) careful attention to distribution of benefits and costs within and among jurisdictions; 11) sensitivity to matters of flexibility and consistency; and 12) partnership perspective regarding the private sector (Park, 1995).

A 1983 national survey of 4,000 contracts between local governments conducted by the Advisory Commission on Intergovernmental Relations (ACIR) showed that the most frequently cited benefit of

cooperation was exploitation of economies of scale. Cooperation was also undertaken to eliminate duplication of services, and occurred most often if provision of the service required a large capital investment. The major factors cited against the use of interlocal agreements were loss of local autonomy, followed by inequitable apportionment of costs (Henderson, 1985; ACIR, 1987). Other studies have also cited various forms of cost savings as the primary motivation for cooperation. These include a study on interlocal cooperation by Honadle (1982) and a study of fire department mergers in Portland by Pittard (1992). Other studies have reinforced the influence of homogeneity of populations, or similarity of preferences, including studies by Nelson (1990) and Ferris and Graddy (1988).

CHAPTER III

THEORETICAL MODEL

1. INTRODUCTION

As noted in the review of literature, several alternative theoretical constructs exist in which the cooperation decision for MSW management may be framed. These include exchange theory and club theory. Modifications of club theory by use of game theory and the Tiebout hypothesis are also available. While all are plausible constructs, all have limitations as previously addressed. When examining alternative theoretical frameworks for the cooperation decision, it is important to bear in mind that, (1) the theoretical model is intended to provide a formal conceptual framework that allows examination of hypotheses regarding factors influencing the cooperation decision, and (2) the theory, while rigid enough to provide a conceptual framework, should also be flexible enough to allow incorporation of other social science perspectives, such as negotiated order theory, institutional arrangements, and pre-conditions to cooperation, since cooperation has been shown to be a process rather than a static state.

The theory developed has benefitted from a grounded theory approach, where a grounded theory is one that is inductively derived from the study of the phenomenon it represents (Glaser and Strauss, 1967; Strauss, 1987; Strauss and Corbin, 1990). The theory is “discovered, developed, and provisionally verified through systematic data collection and analysis of data pertaining to that phenomenon (Strauss and Corbin, 1990, p. 23)”. In this case, collection and analysis of qualitative data through case studies allowed further refinement of theoretical relationships and processes relating to decision making in forming solid waste regions.

2. UTILITY MAXIMIZATION MODEL

A random utility model provides a rigorous decision framework, while allowing incorporation of non-monetary variables into the utility function. This theory asserts that individual units compare utility across two situations and make decisions accordingly. A random utility model allows comparison of alternative solid waste region arrangements through a comparison of the associated indirect utility functions. As a first step in developing the random utility model, it is necessary to examine each individual unit's utility maximization problem. Each unit selects an optimal level of the choice variables that provides them with maximum utility. However, in the case of choosing a solid waste regional arrangement, the utility maximizing arrangement may not be feasibly available, due to constraints. Therefore, a

decision making unit compares each feasible arrangement with their utility maximizing optimal arrangement and forms a solid waste region that is 1) feasible, and 2) approaches utility achievable with optimal levels of the choice variables.

Initially, it is necessary to examine each individual county's¹ utility maximization problem. Let each county's preferences be represented by a utility function, $U[X, Y, A, Z]$, where the county receives utility (or disutility) from consumption of a vector of goods and services, X ; a vector of solid waste services, Y ; an autonomy risk level, A ; and a political risk level, Z . The vector of goods and services X may include services such as education, police protection, or fire protection, and goods such as roads, parks, or school buildings. The vector of solid waste services, Y , may include disposal services such as landfilling for municipal wastes (Class I landfilling), landfilling inert wastes such as construction and demolition wastes (Class IV landfilling), incineration at a WTE facility, curbside recycling, drop-off recycling, backyard composting, or mixed-waste composting. It also may include collection services or education services. The vector Y is the entire solid waste service choice set and includes both public and private service options. It is assumed that every county has every service option available to them. Solid waste services, Y , may be provided publicly by the county,

¹ For simplicity, the theoretical model assumes the base jurisdictional unit to be a "county", although applicable to other forms of jurisdictional division.

or the county may contract with a private firm to provide Y. Thus, there may be a distinction between public and private sources of solid waste services *within* the choice set, but no explicit distinction is necessary *outside* the choice set.

The marginal utility of both X and Y are positive: $\frac{\partial U}{\partial X} > 0$ and $\frac{\partial U}{\partial Y} > 0$. Both X and Y behave as normal goods, i.e., income and demand for X and Y are positively related. It is important to note that it is the *vector* Y that behaves normally. Some particular elements of the choice set may in fact be inferior, where demand for those elements decreases as income increases, but the vector behaves normally². The assumption that Y is a normal good holds regardless of the way in which provision of Y is financed³. Another important distinction to make is that the vector Y is aggregate county solid waste services, not individual household solid waste services, and the normality assumption pertains to the change in county-

² As an example, we may expect that as income increases (which for a county, may be total revenue), demand for convenience centers as a collection method decreases, but demand for curbside pickup increases. As income increases, the county, serving the preferences of its member individuals, is willing to trade off dollars (for more expensive curbside collection as opposed to drop-off convenience centers) for time (curbside is more convenient and requires less time than drop-off). If we are valuing the vector Y by dollars spent on solid waste services, then the overall impact on Y of an increase in income would still be normal, i.e., Y would increase.

³ The assumption of normality refers only to how the level of Y changes as income (county revenue) changes. If county revenue increases, all else being equal, then the county will demand more, not less, solid waste services.

level demand for Y resulting from a change in county revenue. If the level of county revenue increases, all else equal, the county will demand a higher level of X and a higher level of Y.

Let A be a continuous variable representing the level of risk a county faces from a loss of autonomy. Autonomy risk is a measure of a county's ability to prevent undesirable solid waste management practices from occurring within its borders. Autonomy focuses on the portion of county utility (or, rather, disutility) contributed by the perception of autonomy on the part of all county residents as a whole. As a county's autonomy risk increases, they are less able to dictate solid waste management practices within their county. Thus, a higher level of A represents a higher risk of autonomy loss for a given county. Since a loss of autonomy yields disutility, $\frac{\partial U}{\partial A} < 0$. One example of autonomy risk may be the inability to exercise flow control in Class I landfilling. If membership in a particular solid waste region arrangement does not allow a county to exercise flow control, then that arrangement is characterized by a high A, or a high level of autonomy risk, as it is perceived by county residents. The level of Z may be indirectly influenced by the level of A. Increased autonomy risk is likely to increase the potential for political risk.

Let Z be a continuous variable representing the level of political risk a county faces. Political risk is a measure of the probability of intense political conflict within the county or between counties. While autonomy risk

focuses on a risk perception on the part of all citizens collectively, political risk focuses on the contribution to county utility (disutility) contributed by the perception of risk on the part of a small subgroup of elected political leaders, decision makers, or other interested political figures. Similar to autonomy risk, the marginal utility of political risk is negative, $\frac{\partial U}{\partial Z} < 0$. One example of political risk may be siting a landfill in the county. If a particular regional arrangement is likely to require a county to site a landfill within its borders, then the associated political risk level for that arrangement would be high.

Further, define $A(C|C^0)$ and $Z(C|C^0)$, where C^0 is an $(n \times 1)$ vector of characteristics of the individual county and C is an $(n \times 1)$ vector of characteristics associated with the one or more contiguous counties that represent potential partners for formation of a multi-county solid waste region. Let each element of C , C_i , be a continuous variable corresponding directly to individual characteristics of each potential cooperative county. Further, let each C_i be defined such that $\frac{\partial A}{\partial C_i} > 0$ and $\frac{\partial Z}{\partial C_i} > 0$, i.e., the levels of autonomy risk and political risk are increasing in C_i . It is important to bear in mind that C_i is defined conditional upon the own characteristics of that county, C^0 . So the mapping of a characteristic to C_i may be increasing or decreasing, depending upon the initial characteristics. But each C_i is always defined such that A and Z are increasing in C_i , or increasing the level of a characteristic increases the level of autonomy risk and political risk.

The vector C may include, but is not limited to, elements such as population, per capita income, per capita revenue, assessed value, disposal assurance, past cooperation experience, presence of a cooperation entrepreneur, distance, highway infrastructure, tenure of legislative and executive elected officials, bureaucratic structure, or the state of the current MSW management system.

For a county with a characteristic vector $C^0 = [C_1^0, C_2^0, \dots, C_n^0]$, every alternative arrangement of the characteristic vector of contiguous counties, $C = [C_1, C_2, \dots, C_n]$, may be mapped to a corresponding rank of A and Z . This may be illustrated with a simple example. Assume ($n = 1, 2, 3$), such that C_1 represents a measure of disposal assurance, C_2 represents past cooperative experience, and C_3 represents per capita revenue. Assume that the county under investigation has long term disposal assurance, no past cooperative experience, and high revenue per capita. Conditioned upon these own characteristics for this county, C_1 is decreasing in disposal assurance, C_2 is decreasing in past cooperative experience, and C_3 is decreasing in per capita revenue. So, if an arrangement with characteristics including no disposal assurance, no past experience, and a low per capita revenue was under consideration, the county may assign an autonomy risk rank A^i and a political risk rank Z^i . If they were considering another arrangement with characteristics including certainty in long term disposal assurance, numerous successful cooperative experiences, and a very high

per capita revenue, they may assign an autonomy risk rank A^k and a political risk rank Z^m . In this case, $A^j > A^k$ and $Z^l > Z^m$. That is, the characteristics of the first arrangement under consideration cause this arrangement to have a higher autonomy risk and political risk rank than the second arrangement under consideration. Since each element of C is a continuous variable, there are an infinite number of possible characteristic combinations, and thus an infinite number of autonomy risk and political risk rankings. A marginal change in any element of C_i yields a corresponding, but not necessarily equal, change in the rank of A and Z . For example, a change from no disposal assurance to certainty in disposal assurance may effect a substantial reduction in the rank of autonomy risk, but only a moderate reduction in the rank of political risk, while the presence of a cooperation entrepreneur may effect a substantial reduction in the rank of political risk, but a very small reduction in the rank of autonomy risk.

A county allocates expenditures among X and Y , such that

$P^X X + P^Y Y = M$, where P^X is the price of X , and M is total revenue from all sources. P^Y is the price of Y , and is also a function of the characteristics of alternative region arrangements, given the county's own characteristics, where $P^Y [E(C|C^0), T(C|C^0)]$, and E represents the average operational costs of providing solid waste services, characterized by economies of scale, and T represents transaction costs associated with organizing and administering a decision making unit for the provision and management of

solid waste services. The price of Y is increasing in operational costs, such that $\frac{\partial P^Y}{\partial E} > 0$, and the price of Y is increasing in transaction costs, such that, $\frac{\partial P^Y}{\partial T} > 0$.

$E(C|C^0)$ represents average operational costs of providing solid waste services. Several elements of Y are characterized by declining average costs over some range, or economies of scale. One such element is landfill disposal, where reductions in average cost are achievable over some range with larger volumes of waste, through economies of scale. Other elements of the vector Y, such as recyclables collection, garbage collection, intermediate processing of recyclables, solid waste education, or marketing of recyclables, may also be characterized by declining average costs over some range of increases in volume. Certainly, one would expect average operational costs to be declining in a characteristic representing the size of the region.

$T(C|C^0)$ represents transaction costs associated with organizing a unit to determine what solid waste services should be provided, how they should be provided, by whom, and when. Transaction costs are often non-monetary and include the costs involved in carrying out administrative transactions. Transaction costs may include costs such as time, opportunity, travel or communication associated with organizing the provision of any element of the vector Y. Transaction costs associated with forming a solid waste region are expected to be increasing in the

characteristic representing the number of entities comprising a cooperative unit. Thus, one would expect a tradeoff of operational cost savings for increased transaction costs as the number of entities involved in a cooperative partnership increases. In general, characteristics that reduce average operational costs tend to increase transaction costs. Another example is a characteristic representing the level of solid waste services initially provided by potential cooperating partners. By joining another county that has a more highly developed program, a county may be able to reduce average operational costs by reducing costs associated with a learning curve. However, cooperation with such a county would likely be accompanied by higher transaction costs since both would have to redefine goals and priorities to reach a common strategy for progression from two different initial points with respect to provision of services.

Note also that operational costs and transaction costs are both a function of C , the vector of characteristics associated with potential partners in a multi-county solid waste region, and C^0 , the vector of characteristics of the county under investigation. While each element of C is defined such that autonomy risk and political risk are increasing in C_i , the impact of a change in C_i on E and T is indeterminate. That is, $\frac{\partial E}{\partial C_i} \begin{matrix} > \\ = \\ < \end{matrix} 0$ and $\frac{\partial T}{\partial C_i} \begin{matrix} > \\ = \\ < \end{matrix} 0$. For example, for a given county with a given characteristic vector, C^0 , an element of C representing a large population of a potential arrangement may be negatively related to operational costs, characterized

by economies of scale. While a large population may be negatively related to operational costs, it may be either positively or negatively related to transaction costs. The degree to which population of an alternative arrangement impacts either operational or transaction costs is dependent upon the characteristic vector of the unit under evaluation. For another county with a different characteristic vector C^0 , the same potential arrangement with a large population may be positively related to operational costs. This may be the case if the county in question has a population large enough itself to exhaust economies of scale cost savings. When this county considers cooperation with potential partners characterized by a large population, they are not able to take advantage of operational cost savings due to economies of scale. Thus both the direction and the magnitude of the impact of a change in C_i on operational costs or transaction costs are indeterminate. Thus, the impact of a marginal change in a characteristic on the price of Y is indeterminate:

$\frac{\partial P^Y}{\partial C_i} = \frac{\partial P^Y}{\partial E} \frac{\partial E}{\partial C_i} + \frac{\partial P^Y}{\partial T} \frac{\partial T}{\partial C_i} \stackrel{>}{<} 0$. The hedonic price function for Y may then be substituted into the expenditure function, such that

$$P^X X + P^Y [E(C|C^0), T(C|C^0)] Y = M.$$

While the level of Y is a choice variable for the county, Y may be constrained to be above a predetermined minimum level by mandate, or by state or regional planners. For example, a county may be required to recycle a certain percentage of generated MSW, or they may be required to

provide a minimum level of solid waste education, or they may be required to reduce the volume of MSW disposed in a landfill. Under such circumstances, Y becomes further restrained to the following condition: $Y \geq R$, where R is a vector of minimum service requirements for solid waste services. When provision of solid waste services is unrestricted, $R=0$.

The objective of the county, then is to maximize their utility, subject to a budget constraint and a minimum service level constraint:

$$\begin{aligned} \text{MAX } & U(X, Y, A(C|C^0), Z(C|C^0)) \\ \text{s.t. } & P^X X + P^Y [E(C|C^0), T(C|C^0)] Y = M \\ \text{s.t. } & Y \geq R \end{aligned}$$

which may be written as a LaGrangian function:

$$\begin{aligned} \mathcal{L} = & U(X, Y, A(C|C^0), Z(C|C^0)) + \\ & \lambda (M - P^X X - P^Y [E(C|C^0), T(C|C^0)] Y) + \mu (R - Y) \end{aligned}$$

Since a county may maximize utility by choosing not to consume at least one good, a corner solution is feasible. Thus, the Kuhn-Tucker first order conditions for maximizing the LaGrangian function are:

- A. $\frac{\partial \mathcal{L}}{\partial X} = \frac{\partial U}{\partial X} - \lambda P^X \leq 0$
- B. $\frac{\partial U}{\partial X} X = 0$
- C. $\frac{\partial \mathcal{L}}{\partial Y} = \frac{\partial U}{\partial Y} - \lambda P^Y [E(C), T(C)] - \mu \leq 0$
- D. $\frac{\partial U}{\partial Y} Y = 0$
- E. $\frac{\partial \mathcal{L}}{\partial C_i} = \frac{\partial U}{\partial A} \frac{\partial A}{\partial C_i} + \frac{\partial U}{\partial Z} \frac{\partial Z}{\partial C_i} - \lambda \left[\frac{\partial P^Y}{\partial E} \frac{\partial E}{\partial C_i} + \frac{\partial P^Y}{\partial T} \frac{\partial T}{\partial C_i} \right] \leq 0$
- F. $\frac{\partial U}{\partial C_i} C_i = 0$

Equation E is the condition by which the decision making county chooses an optimal level of each of n elements of C . Through careful definition of each C_i , $\frac{\partial A}{\partial C_i} > 0$ and $\frac{\partial Z}{\partial C_i} > 0$. We also know that $\frac{\partial U}{\partial A} < 0$ and $\frac{\partial U}{\partial Z} < 0$, thus $\frac{\partial U}{\partial A} \frac{\partial A}{\partial C_i} < 0$ and $\frac{\partial U}{\partial Z} \frac{\partial Z}{\partial C_i} < 0$, so that $\frac{\partial U}{\partial A} \frac{\partial A}{\partial C_i} + \frac{\partial U}{\partial Z} \frac{\partial Z}{\partial C_i} < 0$.

Joining a multi-county solid waste region with a given set of characteristics may lower utility by increasing the autonomy risk and increasing the political risk. So why would a county choose to join a multi-county solid waste region? Recall that the sign of $\frac{\partial E}{\partial C_i} \begin{matrix} > \\ < \end{matrix}$ is 0. In some cases, joining a region may cause this sign to be negative. That is, by joining a solid waste region with particular characteristics, average operational costs may decrease, causing a reduction in the price of Y . As noted earlier, $\frac{\partial Y}{\partial P^Y} < 0$ and $\frac{\partial U}{\partial Y} > 0$. Thus, utility is actually increased when the characteristic is negatively related to operational costs, through the resulting impact on the price of Y and the resulting level of Y . So a county will only choose to cooperate at when the characteristics of a region arrangement potentially reduce average operational costs. The utility gain from choosing a characteristic level that decreases average operational costs, however, is partially or fully offset by a concurrent utility reduction from an increase in autonomy risk, political risk, and transaction costs resulting from choosing a positive level of any characteristic C_i . So from equation E, one should note the tradeoff a county experiences in choosing a positive level of any characteristic. By this condition, a county will optimally choose a positive

level of each characteristic only if the marginal gain from lowering average operational costs outweighs the marginal loss from increasing transaction costs, autonomy risk, and political risk.

3. UTILITY DIFFERENCE MODEL

Solution to first order conditions A-F yields the demands for the choice variables, X , Y , and C_i , as a function of the exogenous variables, P^X , C^0 , M , and R :

$$X (P^X, C^0, M, R)$$

$$Y (P^X, C^0, M, R)$$

$$C_i (P^X, C^0, M, R)$$

Optimal levels of each choice variable may be denoted X^* , Y^* , C_i^* . A set of n optimal characteristic elements comprises an optimal characteristic vector C^* . By substituting these optimal demands into the original utility function, one may obtain an indirect utility function,

$V (X^*, Y^*, A(C^*|C^0), Z(C^*|C^0))$. When optimal levels of each choice

variable are chosen, this indirect utility function yields the maximum achievable utility. The *optimum* level of C , however, assumes that a county may choose any level of a characteristic. For example, a county may achieve maximum utility by choosing to cooperate with a county with a population of 150,000, with substantial past experience in cooperation, with a high per capita revenue, certainty in disposal assurance, and a well-

developed recycling program. But an arrangement with these characteristics may not be a feasible consideration for the decision making county. The indicator "feasible" refers to a limitation of the choice set, as limited by legislated requirements, decision maker preferences, or norms and values. For example, if a county limits their feasible choice set to to cooperation among counties with which it shares a border, neighboring counties, this ideal partner(s) may not exist as a feasible alternative.

So the county begins the second stage of the decision process. The first stage was to maximize their utility function subject to a budget constraint and a service level constraint to determine optimal levels of choice variables, X , Y , and C_i . The characteristic levels chosen as optimal then become the characteristic "wish list" for the county. The county would receive maximum utility from choosing to cooperate with another county(s) possessing these characteristics. However, these optimal characteristic levels may not be available, given the characteristics of counties that may feasibly serve as cooperation partners. For example, a small rural county of 25,000 without a landfill may optimally choose to join an urban county of at least 150,000 with a landfill. But realistically, rural counties are often grouped together geographically, and such an ideal may not exist. So the second task of the decision making county is to compare the utility outcomes of feasibly available alternatives with the maximum utility level of

the ideal partner(s) and choose the alternative that minimizes the difference between the ideal outcome and available outcomes.

In the second stage, the decision making county evaluates the level of indirect utility achievable under every feasible alternative regional arrangement, $V(X^i, Y^i, A(C^i|C^0), Z(C^i|C^0))$, where $i = 1 \dots n$ and n is the number of feasible alternatives. For example, if the decision making county is surrounded by four neighboring counties (counties sharing a border with the decision making county), and they limit their feasible choice set to alliances with counties with which they share a border, then they may consider 14 possible alternatives (one single-county arrangement, four two-county alliances, four three-county alliances, four four-county alliances, and one five-county alliance), so that $n = 14$. The county then subtracts the achievable utility for each of n alternatives from the maximum achievable utility:

$$V(X^*, Y^*, A(C^*|C^0), Z(C^*|C^0)) - V(X^i, Y^i, A(C^i|C^0), Z(C^i|C^0))$$

Assuming a linear functional form, the objective of the county then becomes to choose the alternative from n available alternatives that minimizes the utility difference:

$$\Delta V[(X^* - X^i), (Y^* - Y^i), (A(C^*|C^0) - A(C^i|C^0)), (Z(C^*|C^0) - Z(C^i|C^0))]$$

4. COOPERATION NEGOTIATION

Once a county chooses an alternative that is feasible and minimizes the difference between optimal utility and achievable utility, they may pursue this alternative, but they cannot unilaterally choose this alternative. All counties are undergoing this same process simultaneously. Each county individually chooses an optimal level of choice variables and then compares the utility outcome of feasible alternatives with the utility maximizing outcome. So each county emerges from the process with a ranking of region formation alternatives according to their difference from maximum utility.

As a simple example, suppose there are only two counties, A and B, and each county only has two alternatives: to form a single-county region or to join the other in forming a two-county region. Suppose the utility difference from the optimal level for each alternative is shown below.

	Single	Multi
County A	5	15
County B	25	10

County A's utility would be maximized by forming a single-county region.

County B's utility would be maximized by forming a two-county region with

A. But if A forms a single-county region, then B has no choice but to also form a single-county region, and B's utility would be 15 units lower.

However, if county A can be coerced into forming a two-county region, their utility would be reduced by only 10 units. A move from two single-

county regions to one two-county region would benefit B by 15 units, while only *costing* A 10 units. If county B could use this potential gain to offset A's loss, then both may be able to minimize their utility difference by forming a two-county region. For example, if B is able to achieve a utility difference gain for A of at least 10 units by agreeing to an arrangement that reduces A's transaction costs or risk at a *cost* to B of no more than 15 units, then the negotiation results in a Pareto improvement for both parties. This may be illustrated in Figure 1, where the utility outcome after B negotiates a reduction in transaction costs or risk for A is a utility difference for A of 5 units and a utility difference for B of 20 units. Thus, B might yet be able to gain 5 units of utility, over the single-county option A would have forced them into, through negotiating an agreement that reduces the expected losses for A associated with cooperation.

This type of matching and negotiation is assumed to take place among all potential partners until all potential Pareto improvements are exhausted and an optimal feasible arrangement emerges. The characteristics of counties in the feasible choice set influence a county's decision in two ways. First, they directly influence the autonomy and political risk a county would face and the price a county would pay for solid waste services under a cooperative arrangement. Thus, they indirectly influence a county's utility. But all counties undergo the same decision process simultaneously, and cooperation requires willingness on the part of

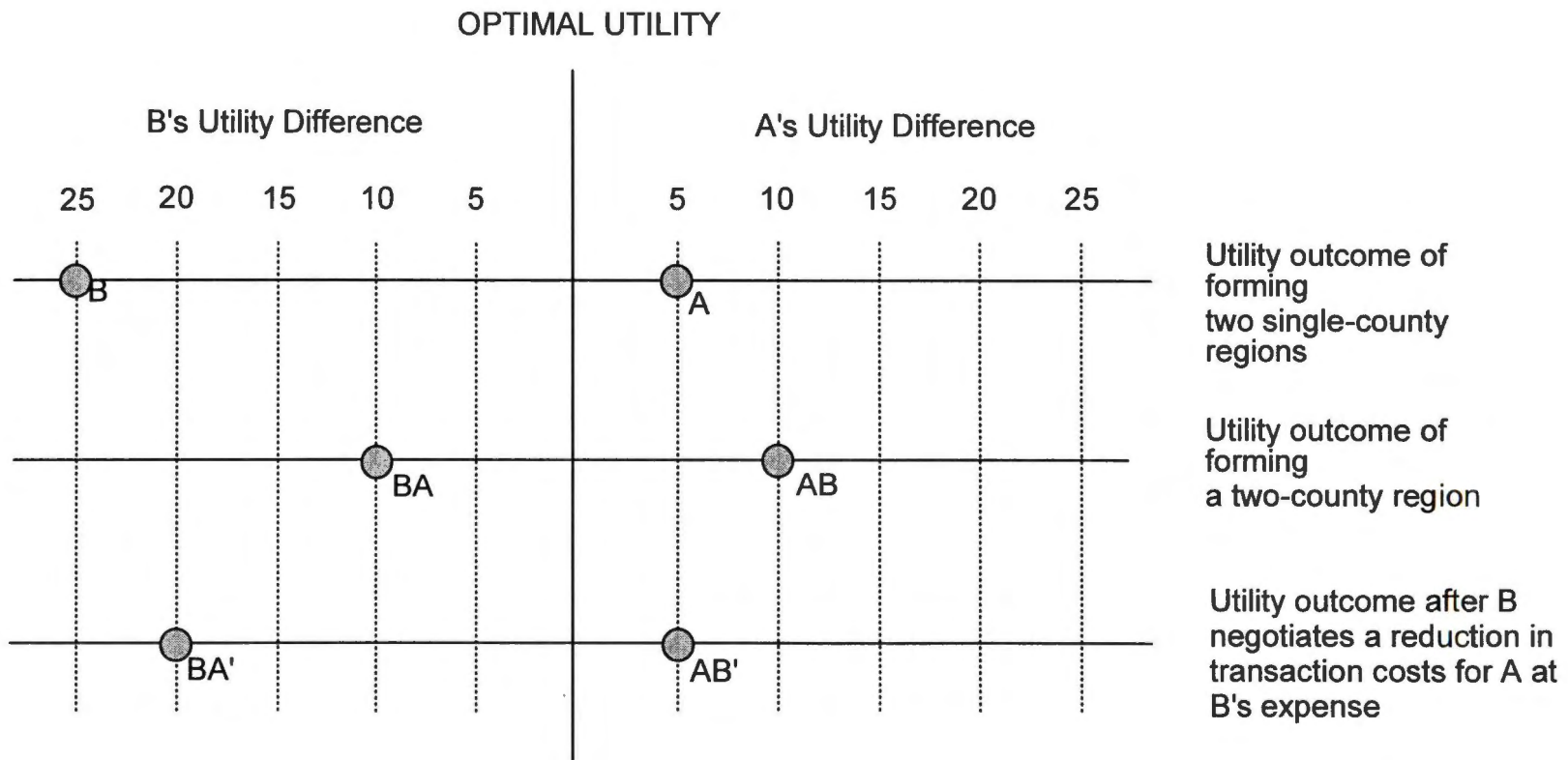


Figure 1. Bargaining Strategies in Negotiating Cooperation Outcomes

all participants. So the characteristics of other counties also impact the final outcome through their influence on other counties' utility maximizing preferences and the implications of these preferences on their willingness to cooperate and their leverage in negotiating a cooperative arrangement.

CHAPTER IV

CASE STUDIES

1. INTRODUCTION

Tennessee passed a comprehensive Solid Waste Management Act in 1991 (T.C.A. §68-211-801 et seq.). Passage of this Act was the first effort by the state to require all counties to meet a minimum standard level of service in the area of solid waste management. Elements of the legislation addressed solid waste planning, collection, disposal, recycling, education, and funding as well as collection and disposal of problem wastes.

Specifically, the legislation required each county to form a solid waste region and to develop a comprehensive ten-year solid waste plan for the region. One required element of the plan was reduction in the per capita amount of waste entering landfills or incinerators by 25% by December 31, 1995, using 1989 as the benchmark. The legislation also required that at least 90% of all residents have collection service available to them. The minimum collection service level was established to be a system of drop-off convenience centers for garbage collection. Additionally, each county had to establish a minimum of one collection center for recyclable materials.

Whole tires were banned from class I landfills, with provisions for tire-shredding services included as part of the legislation. A disposal surcharge on each ton of waste disposed and a retail surcharge on new tire purchases were also included. Other elements of the legislation included requirements for MSW education, and detailed progress reporting. Grant programs were established for planning, convenience center establishment, household hazardous waste collection, tire storage, and landfill scales purchase. Recycling rebates were established for the eleven largest counties.

As a first step in comprehensive MSW planning, solid waste advisors in each of nine development districts were initially charged with identifying "rational waste disposal areas", based on geography, existence of a viable disposal facility that would likely remain in operation, any existing cooperation, and volume of waste disposed. The legislation required that these findings be presented to counties within the district in the form of a "District Needs Assessment" by September 30, 1992. Each county was then required to form a solid waste region by December 12, 1992.

According to Section 12.a.2. of the Act, "The preferred organization of the regions shall be multi-county. Any county adopting a resolution establishing a single county region shall state the reasons for acting alone in the resolution." In addition to statutory language, monetary incentives were added to the planning grant structure to encourage formation of multi-county regions. If a county chose to form a single-county region, they

received a planning grant of \$15,000. If a county joined one other county, both counties received a planning grant of \$17,500, and if a county formed a region with at least two other counties, all counties received a planning grant of \$20,000. State-employed technical staff also encouraged formation of multi-county regions.

The objective of each municipal solid waste region was to develop a ten-year comprehensive solid waste management plan. After the Needs Assessments were completed, each county had approximately ten weeks to decide whether they would form a single-county solid waste region, or whether they would join neighboring counties to form a multi-county region. There were no upper limits placed on region size, provided that all region members were contiguous counties. The decision each Tennessee county made regarding formation of a solid waste region and the resulting action toward solid waste management provides a natural experiment in which multi-county cooperation in solid waste management may be examined qualitatively through case studies.

This chapter presents five selected case studies of solid waste region formation in Tennessee. Two of the five cases are single-county regions, one is a three-county region, one is a ten-county region, and one was a three-county region that has split into a two-county region and a single-county region. The cases vary widely in composition and characteristics, past experience in solid waste, and outcomes. In addition to providing

insight into the process whereby the counties decided to form the particular region, the cases also allow study of the results of the decisions the counties made. The cases examine actual MSW management services and activities and how they were impacted by the region established.

A. Case Study Selection

Cases were selected in an effort to ensure diversity of the cases and to further the understanding of the regionalization process and its outcomes. Elements of the decision process and resulting outcomes the study attempts to capture include single and multi-county regions, small and large multi-county regions, multi-county regions with prior grassroots cooperative experience, dis-banded multi-county regions, rural and metropolitan regions, regions with loose ties, and regions with formal legal arrangements. To aid in case selection, an initial interview was conducted with each of nine development district solid waste consultants in the state. Development district staff were able to provide information about how each region was formed and a summary of each region's solid waste activities since region formation. Based on this information, it was possible to select cases with elements required for development of a complete picture of solid waste cooperation and its outcomes.

B. Case Study Method

The case studies focus on region formation decisions made in 1992. These decisions were political in nature, and often elected officials were

involved in key decision making roles. Considering the frequent change of political tides, decisions made five years ago often involved a set of players quite different from those currently occupying similar roles. The institutional arrangements of individual counties also contributed significantly to the decision making process. Depending on the particular set of institutional arrangements in place in an individual county, sources of information and decision making channels varied greatly. These factors make it difficult to standardize a method for conducting the case studies.

The first contact in each case was the solid waste consultant for that county's development district. In only one case had the current development district solid waste consultant been in this role since the time the decision was made in 1992. But in each case, the development district consultant could provide a brief summary of the current MSW management program in place in each region. Included in this interview was a request for identification of individuals who were involved in the decision making process, or who might be able to provide insight into the case. A second target interview was sought with the county executive who was in office in the county during the 1990-1994 term. When this was not possible (and sometimes in addition), an interview was sought with the current county executive, serving a term from 1994-1998. As part of this interview, county executives were asked to identify individuals that played key roles in the decision making process and in the management of MSW. Each

subsequent contact was also asked to identify individuals that may be able to provide insight into development of the case, resulting in further contacts. The process was repeated until a clear picture of the case under investigation began to emerge.

For each of the five cases, a brief description of the county (counties) involved and the management of their MSW prior to passage of the 1991 Solid Waste Management Act is given. This is followed by a description of the process that led them to form a single- or multi-county solid waste region and factors that were influential in this decision. The next section then describes what happened in the county (counties) once they had formed a solid waste region, including development of their ten-year plan and implementation of this plan to date. Finally, lessons learned and points of interest from the case are discussed. This section attempts to link the case study decision process and the outcomes to the theoretical model previously developed.

2. COCKE COUNTY SOLID WASTE REGION

A. History and Background Information

Cocke County, Tennessee, is located in the eastern part of Tennessee and is home to 29,141 residents. Figure 2 shows the county location, and Figure 3 displays selected characteristics of the county and neighboring counties. The county borders North Carolina, separated by the Appalachian

A map of Tennessee showing all 95 counties. The county of Cocke is highlighted in a dark gray color, while all other counties are in a light gray color. The counties are labeled with their names: Stewart, Montgomery, Robertson, Sumner, Macon, Clay, Pickett, Scott, Campbell, Claiborne, Hancock, Hawkins, Sullivan, Johnson, Obion, Weakley, Henry, Houston, Jackson, Overton, Fentress, Union, Grainger, Washington, Carter, Dyer, Gibson, Carroll, Benton, Humphreys, Cheatham, Davidson, Wilson, Smith, Putnam, Morgan, Anderson, Hamblen, Greene, Unicoi, DeKalb, White, Cumberland, Roane, Sevier, Cocke, Loudon, Blount, Madison, Henderson, Decatur, Perry, Hickman, Williamson, Rutherford, Cannon, DeKalb, White, Van Buren, Rhea, Bledsoe, Monroe, McMinn, Polk, Hamilton, Bradley, Grundy, Coffee, Warren, Bedford, Marshall, Maury, Lewis, Chester, Haywood, Crockett, Tipton, Shelby, Fayette, Hardeman, McNairy, Hardin, Wayne, Lawrence, Giles, Lincoln, Franklin, Marion, Moore, and Sequatchie.

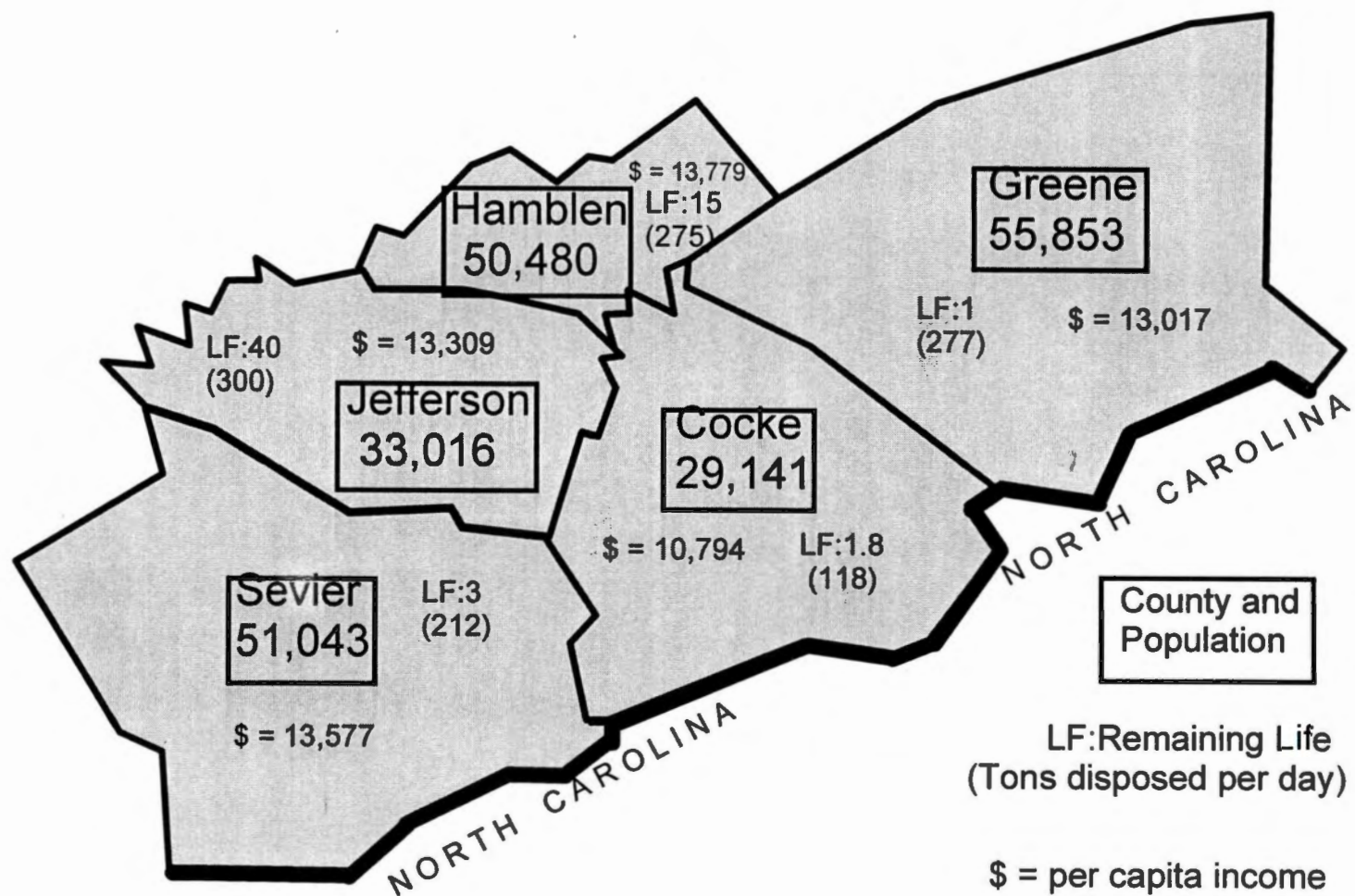


Figure 3. Characteristics of Cocke County and Surrounding Counties.

Mountains. Approximately half of the county is mountainous terrain, and the northeast corner of the Great Smoky Mountains National Park extends into the southwest corner of Cocke County. The city of Newport, population 7,123, is the county seat.

Prior to passage of the 1991 Solid Waste Management Act, Cocke County provided a system of green boxes for drop-off collection of garbage. The city of Newport provided curbside collection for its residents. No known recycling opportunities were available in the county. The county owned a Class I landfill, and processed 100-120 tons per day at the landfill. At the time that the county was required to form a solid waste region, Cocke County had 1.8 years remaining life at their landfill. The landfill did not meet recent federal Subtitle D landfill requirements, and was scheduled to close in March, 1994, as required by Subtitle D. Prior to passage of the Act, solid waste management, including operation of the landfill, was handled by the Landfill Committee, which was a standing committee of the county commission, comprised of seven members, or half of the entire commission.

B. Decision Process

Early in 1992, the Tennessee Department of Environment and Conservation (TDEC) sent a letter to each county executive in the state that detailed the requirements of the Solid Waste Management Act. Then the development district contacted the county executive upon completion of the

District Solid Waste Needs Assessment (approximately September, 1992) to inform them of the findings of the needs assessments and to advise them in forming solid waste regions to develop 10-year plans, as required by the Act.

Cocke County elected to form a single-county region, without serious consideration of multi-county region options. The Landfill Committee of the county commission that was previously in existence remained, and five of its seven members were appointed to the new Cocke County Solid Waste Board, composed of 2 members representing the city of Newport and 3 members representing the county. All appointments were made by the county executive, and all were members of the county commission. Upon the recommendation of the county executive, the board recommended to the county commission that the county form a single-county solid waste region, and a resolution to this effect was adopted by the entire commission. The function of the board was primarily to meet requirements of the Act, and they generally acted as a rubber stamp for the county executive's recommendations.

There were three influences that resulted in this decision: (1) there was a very strong desire to have a landfill in the county, (2) there was strong opposition to importing any waste into the county, and (3) the county felt that the position of neighboring counties with respect to solid waste management left them no choice but to plan independently. County

leaders felt that a landfill in the county was imperative for recruiting industries to the county and for economic development. They also felt that forming a multi-county solid waste region was the equivalent of importing out-of-county waste. While they were considering alternative courses of action once the existing landfill closed, Cocke County was approached by a private waste management firm about locating a private landfill in the county. But the site that was initially proposed was unacceptable to county leaders, and when they learned that the private firm intended to import out-of-county waste, they ceased communication.

Four counties border Cocke County, but no formal contact was made with any of them regarding multi-county cooperation. Selected characteristics of these counties may be found in Figure 3. Prior to passage of the Act, Sevier County had secured a long-term contract with a private firm for mixed waste composting of all MSW. MSW is delivered to their processing center where some recyclable materials are manually sorted. Remaining waste is mixed with sludge in large digesters. The product is then placed in windrows resulting in a usable compost product. Cocke County felt that Sevier County had the management of their MSW under control and would not be interested in cooperation. A large private Subtitle D landfill designed to handle 400 tons per day for 40 years had recently been constructed in Jefferson County. Similarly, Hamblen County had recently constructed a public Subtitle D landfill, permitted for 15 years.

Greene County was in a situation similar to Cocke County, where their landfill was scheduled to close when Subtitle D regulations became effective. However, Greene County had already made arrangements with a large private landfill in neighboring Hawkins County to service a transfer station in Greene County and export to Hawkins County upon closure of their landfill. It appeared that all of their neighbors either had a landfill or had made long-term arrangements for disposal. So in the opinion of Cocke County decision makers, the only way they could have a landfill in their county, which they strongly desired, was to form a single-county solid waste region. All of the decision makers interviewed reported that they didn't really see that Cocke County had any choice but to be a single-county region.

County officials reported that the monetary incentive built into the planning grants in an effort to encourage formation of multi-county solid waste regions had no bearing on their decision to form a single-county region, claiming that the amount of the incentive (\$2,500 to \$5,000) was too small to make any difference at all. The East Tennessee Development District (ETDD) had agreed to do a limited number of ten-year solid waste plans. Cocke County made an early request for the ETDD to develop their plan for a price equal to that of the base state planning grant, \$15,000, and they agreed.

C. Organization and Activities

Since the primary goal all along had been to construct a new landfill in the county once the existing landfill closed, the county contracted an engineering consulting firm to evaluate the chosen landfill site and to estimate the cost of construction and maintenance. The consultants estimated that a Class I Subtitle D landfill would cost Cocke County an average of \$40 per ton over 20 years. This estimate included costs of development, operation, closure, and monitoring. It did, however, assume that the county could obtain a permit for the selected site, which was the property adjacent to the current landfill nearing closure. The state failed to grant a permit for the proposed site due to problems with groundwater monitoring. The county still plans to construct a new landfill, but an acceptable site has not yet been found.

In the meantime, the deadline for compliance with Subtitle D was extended to October, 1996. Additionally, Cocke County's landfill (along with several other landfills in the state) was granted a variance that allows vertical expansion in the landfill's current waste footprint and extends the life of the landfill through January, 1997. But Cocke County's landfill reached maximum capacity and was forced to close permanently in June, 1996. Cocke County negotiated a contract with a private waste management firm to handle disposal after closure of the landfill. Cocke County now hauls collected waste to the county's transfer station located

at the closed landfill site, where they pay a set fee per ton for the private firm to haul waste to the disposal site. Transportation fees and tip fees are all paid through the private firm. MSW is hauled to Hamblen County and disposed in the landfill owned and operated jointly by the city of Morristown and Hamblen County. While Cocke County is indirectly cooperating with neighboring Hamblen County, no formal contact has been made between local governments. Cocke County's contract is with a private firm, which in turn has a contract with the Morristown/Hamblen County Landfill. Cocke County has been permitted to construct a Class III/IV landfill (for construction and demolition waste and yard waste) at the site of the current landfill, and it was scheduled to open in October, 1996.

The former green box collection system has been converted to ten full service convenience centers. Eventually, recycling will be available at all convenience centers, but it is currently in place in less than half of the sites. The city of Newport provides curbside garbage pick-up for its residents and commercial businesses and provides opportunities for drop-off recycling. Newport owns a material recovery facility (MRF) for intermediate processing of recyclables and all recyclables collected by the county are donated to the city facility.

The responsible unit recognized by the state for management of MSW is the solid waste region, which may be a minimum size of a single county. Traditionally, most cities have handled MSW management independently of

counties, and such has been the case in Cocke County. But when the county formed a solid waste region, the responsible unit for all MSW management in the county, including residents of the cities, became the county. So while the county did not cooperate in the management of MSW with neighboring counties, some degree of cooperation was required within the county. The city of Newport and Cocke County worked very well together to expand solid waste management services as long as the county-owned landfill was still operational. But when the county began exporting waste to Hamblen County via a private firm, problems began to surface. The city had been providing collection and paying tip fees at the county landfill. When the landfill closed, they were then required to pay disposal fees charged by the private firm, which were higher than the landfill tip fees previously charged. In response, the city cut off service to many commercial businesses. As expected, the reduction in service has caused a great deal of conflict, and as yet, the situation has not been resolved. Interestingly, the fees charged by the private firm were higher than the previous fees, but less than the estimated fee required if the county were able to construct and operate a new Subtitle D landfill at the site of the old landfill.

Oversight of the region decision, plan development, and plan implementation has been primarily the responsibility of the county executive. While the solid waste board is still functioning, it does not play an active

role in decision making or in implementation. Other aspects of the solid waste management plan include a recent application for a state education grant. Education is currently limited to that provided by a local Keep America Beautiful chapter. Yard waste and brush were banned from the landfill, and are not accepted according to the recent private disposal contract, to help meet the 25% reduction goal. Tires are collected at the landfill and shredded by a state-contracted shredder, then landfilled.

D. Lessons Learned

There are several interesting elements associated with the Cocke County Solid Waste Region that should be emphasized. First is that potential cost savings in landfill disposal through regional cooperation was not a pivotal decision factor in the Cocke County case. Shortly after the needs assessment was presented to the county, development district and County Technical Assistance Service (CTAS) staff presented the county executive with cost estimates of operating a new Subtitle D landfill independently. These projected cost increases were not judged to outweigh potential losses in economic development and autonomy associated with *not* having an independent landfill. In fact, it appears that the county gains significant utility just from having a landfill in their county and having autonomy over the waste disposed there. The desire to have a landfill was so great that the cost of the landfill was a secondary consideration. In fact, the cost associated with disposal was not an issue until it caused conflict.

County officials wanted to develop a new Subtitle D landfill, regardless of the cost, but when actual disposal costs increased by a small amount when the county entered a private disposal contract, cost became a significant issue. It appears that in the Cocke County case, potential operational cost savings due to economies of scale, which were made known to decision makers, were outweighed by potential losses in autonomy associated with multi-county cooperation in solid waste planning.

The Cocke County case also effectively illustrates the point that cooperation is a process. The county chose to form a single-county region to develop their ten-year solid waste management plan, with no intentions of cooperating with any other entity, either public or private, to manage MSW. But future events (i.e., failure to permit a Class I Subtitle D landfill) necessitated some cooperation to secure a future disposal alternative. Also illustrated is the role a private firm may play as an independent broker, or a third party negotiator in cooperative arrangements. Cocke County decision makers did not initially choose to investigate potential cooperation with Hamblen County because they felt the goals and current situations of each county rendered them incompatible as cooperative partners. Cocke County was determined to operate an independent landfill. Hamblen County already had a landfill capable of handling their waste in the long run. Thus Cocke County decision makers could see no benefit to be gained through cooperation with Hamblen County. So when Cocke County was forced to

find a short term solution apart from their long term interest in an independent in-county disposal facility, why did they not negotiate directly with Hamblen County? One possible explanation may be that a private firm acting as a broker between counties may have been able to reduce transaction costs and political risk associated with negotiating an agreement. The objective of the firm is assumed to be profit maximization, while the county seeks to minimize political risk and maintain autonomy, in addition to minimizing costs. A third party without a stake in the local politics associated with conflict resolution may be able to negotiate an agreement at lower transaction costs.

Cocke County had to make considerable changes to their MSW management system to comply with requirements of the Act. The solid waste constraint imposed by the Act was significantly binding in the Cocke County case. While this constraint involved an array of solid waste services, the only issue mentioned in the decision process was disposal. The Act addressed recycling, waste reduction, education, and a wide variety of solid waste issues, but the only aspect initially considered in Cocke County was disposal. Disposal is likely the most politically volatile of solid waste issues. This may suggest that MSW management is short-sighted when handled by elected officials. ✓ Rather than address MSW management as a whole, political considerations may have forced disposal to precede consideration of other aspects of solid waste management. It

appears that disposal was the only concern until it was reasonably assured, and then other aspects of MSW management received attention.

Control of solid waste management in the Cocke County case rested almost entirely with the county executive. Institutions in place in Cocke County allowed the county executive nearly full control of the region formation decision and subsequent compliance with the Act. In the case of Cocke County, the county executive is a politically powerful local figure and has assumed nearly full responsibility for the management of solid waste. In this case, the institutional arrangements in place have reduced the number and scope of decision makers significantly, even further reducing the likelihood of multi-county cooperation.

While the additional funds available to counties cooperating in solid waste management were intended to encourage cooperation, this incentive was essentially negated in the Cocke County case. ETDD staff offered to handle the planning requirement for the price of the base state planning grant. This had almost the same effect as excluding the requirement of development of a ten-year plan, undermining the monetary planning grant incentive.

3. SCOTT COUNTY SOLID WASTE REGION

A. History and Background Information

Scott County is a rural county located in the northeastern part of the state, bordering Kentucky. Figure 4 shows the county location, and Figure 5 identifies several selected characteristics of Scott and surrounding counties. There are three incorporated cities in Scott County: Winfield, Oneida, and Huntsville, the county seat. Scott County's population is 18,358 and they typically dispose of 30 tons of MSW per day. Scott County is a mountainous region, as is much of eastern Tennessee, and the northwestern corner of the county is designated as part of the Big South Fork National River and Recreation Area. The county is located in the Appalachian coal region, and coal mining was the county's largest employment sector until recently.

Before developing their ten-year solid waste management plan, Scott County collected MSW for disposal through a green box drop-off system. The city of Oneida operated a collection service for residents, and Winfield and Huntsville each contracted with a private hauler to provide collection services for residents. No recycling or education efforts were in existence. The county owned a landfill and all of the county's waste was disposed at this landfill. The developed landfill had space for 15 years of disposal, but was not compliant with Subtitle D, and was expected to close in March, 1994 (later extended to October, 1996) as required by Subtitle D. The

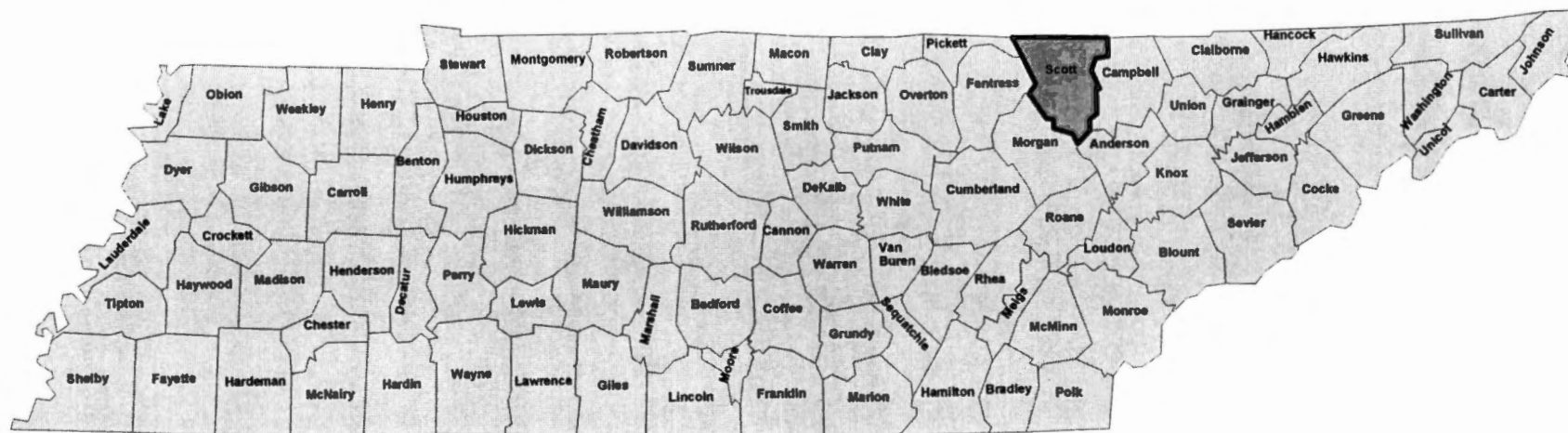


Figure 4. Scott County Solid Waste Region

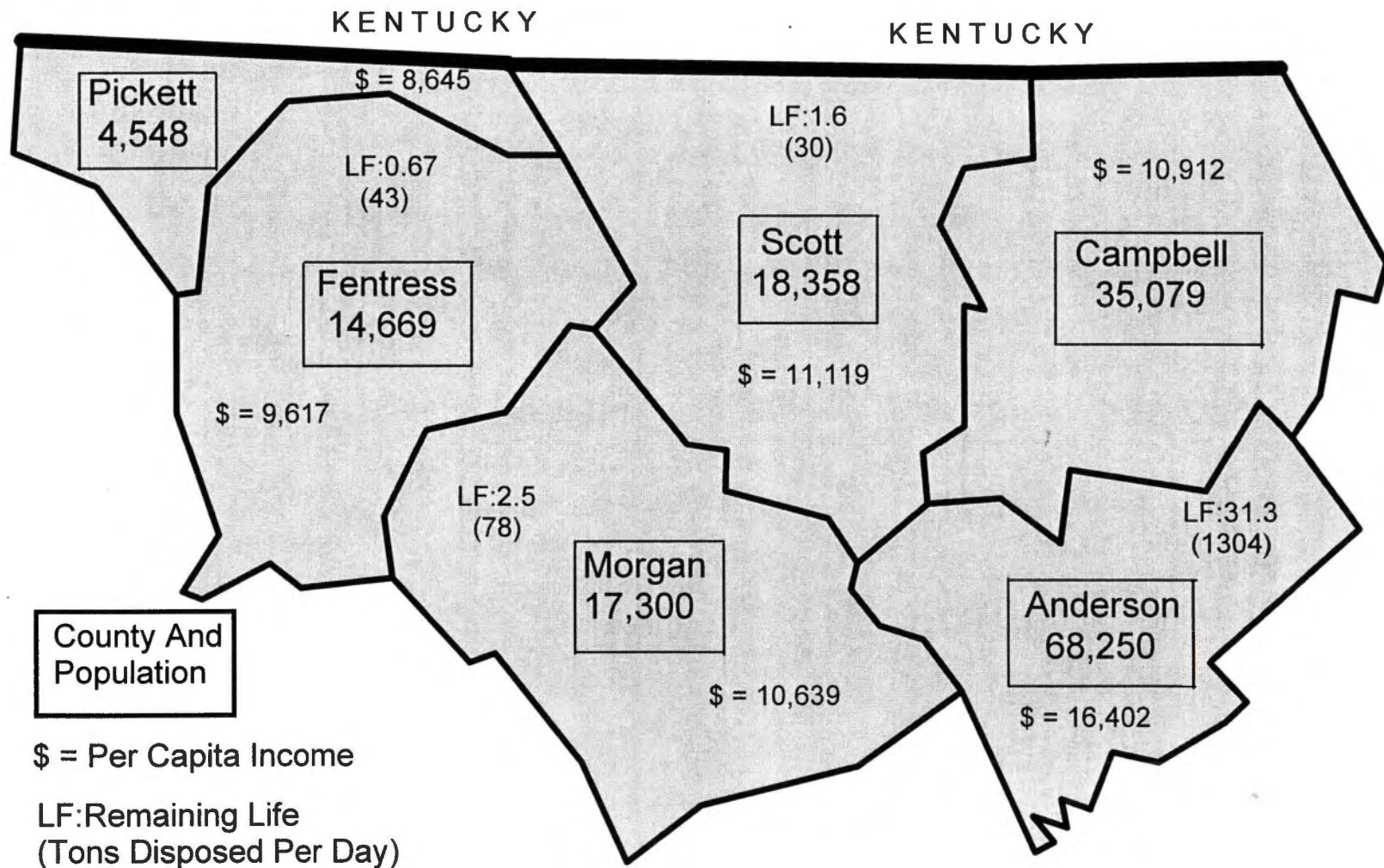


Figure 5. Characteristics of Scott County and Surrounding Counties.

landfill was purchased in 1990 from a private individual. While Subtitle D regulations were in place at the time of the landfill purchase, few decision makers viewed Subtitle D as binding and many were convinced that the landfill would remain operational for 15 years, with an option to expand significantly.

B. Decision Process

Upon completion of the needs assessment, the Development District staff made a presentation to the county commission. In this presentation, the development district solid waste consultant recommended that Scott County form a multi-county solid waste region with Campbell and Morgan Counties, primarily because the three counties together would likely be able to manage solid waste cheaper than each county individually. Campbell, Scott, and Morgan County Executives exchanged correspondence and met at least once to discuss the possibility of forming a multi-county region. The Scott County Executive also met with the Fentress County Executive to discuss the possibility of cooperation. But with the deadline for region formation quickly approaching, each decided to form a single-county region. Scott, Campbell, and Morgan Counties, however, added a clause to their resolutions that left a window open for future cooperation in forming a multi-county solid waste region if they deemed it necessary.

According to the county executives, each county realized that they could probably handle the problem better together, but it was easier to sell a

single-county region to the county commission, which had to approve resolutions creating solid waste regions. The implications of Subtitle D and the Solid Waste Management Act were not yet fully understood, and county executives felt that there was not sufficient time to wage the political battle necessary to form a multi-county region, or to educate local decision makers about the benefits of cooperation. The findings of the needs assessments were presented in late September, 1992. Local elections were then held in November, 1992, so no action was taken prior to the elections in anticipation of potential political changes. Once the elections were over, the newly-elected county commissioners had only a month to decide the composition of the solid waste region, in addition to familiarizing themselves with other issues of local importance.

Several other factors contributed toward Scott County's decision to form a single-county region. Of primary importance was the anticipated handling of future disposal. Local publicity assured citizens that the landfill recently purchased would serve their disposal needs for the next 15 years. Although this information was inaccurate, it was then hard to convince county commissioners, and even harder to convince residents that this landfill was not acceptable and proper disposal would be very expensive. Since local residents and many county legislators were convinced that relatively cheap disposal was assured for 15 years, they saw few benefits to cooperation with other counties that also appeared to have disposal

assurance. Likewise, they also saw few benefits for cooperation with other counties that did not have disposal assurance, since they were strongly opposed to importation of waste. They assumed that cooperation with a county that did not have disposal assurance would mean that they became responsible for also assuring disposal capacity for region partners. Local decision makers felt like their solid waste management situation was under control, and they wanted to protect their citizens from outside waste, and from higher taxes or charges.

Another factor contributing toward the decision was the MSW management situation in each of the surrounding counties. Fentress County to the west was trying to develop their own Subtitle D landfill and was looking for counties to contribute waste. Since Scott County was anticipating disposal assurance for 15 years, they did not consider this a viable option. Morgan County to the southwest is the site of a regional prison, which provides labor for the county's landfill. They, too, anticipated that disposal was assured for the ten-year planning period. Anderson County is a metropolitan county with a population more than three and a half times that of Scott County. Anderson County to the southeast is the site of a large private Subtitle D landfill that processes approximately 1,400 tons per day from Anderson and Knox Counties, so cooperation was not even considered in this case. Campbell County to the east did not have a landfill, and since Scott County anticipated long-term disposal capacity, they

feared becoming a dumping ground in the case of an alliance with Campbell County. The multi-county option most seriously considered was an alliance among Scott, Campbell and Morgan Counties. The county executives decided, however, that, "[The goals] of the three counties are so far apart that we are not compatible as a team (Scott County Executive, 1996)."

Both Scott County and Cocke County (the case previously presented) are in the ETDD. Similar to the situation of Cocke County, Scott County requested that the ETDD solid waste consultant develop their ten-year comprehensive solid waste management plan. The ETDD agreed to write the plan for the price of the base planning grant the Act awarded. Thus, the planning grant "bonus" for forming a multi-county region, had no impact on the decision of the county to form a single-county region.

C. Organization and Activities

Scott County chose to form a single-county solid waste region primarily because (1) they wanted to have a landfill, (2) they did not want to import out-of-county waste, (3) they assumed they had disposal assurance for 15 years, and (4) they felt they didn't have time to sufficiently explore multi-county cooperation alternatives and their implications. As one might expect, dependence upon disposal assurance from a landfill not compliant with Subtitle D led to much strife when the county began developing their ten-year plan. The landfill was operating at a significant loss. The financial strain became so great that the county was forced to negotiate a contract

with a small local firm to operate the landfill. The arrangement was by monthly contract and gave Scott County "free" disposal at the landfill. But, the only way the private firm would accept the contract was if they were allowed to import out-of-county waste. Waste from Campbell County, Fentress County, and two counties in Kentucky is currently disposed in the landfill owned by Scott County and privately operated. Scott County residents were initially disturbed by the importation of waste, but public education regarding the alternative, higher taxes or fees, quieted the controversy.

So the financial situation of the landfill caused Scott County to trade autonomy over their landfill for free disposal and host fees they negotiated with the private firm for all waste imported into Scott County. The private firm currently operating the landfill has applied for a permit to develop a new Subtitle D Class I landfill in the county, but the permit is still pending. In the meantime, Scott County has applied for a variance for extending the life of the current landfill. However, the length of the extension and the status of the permit are unknown at this time. When the landfill closes, Scott County will be responsible for charges associated with closure, expected to be approximately \$1.5 million. Additionally, Scott County will no longer receive free disposal and will be subject to tipping fees for disposal, and will lose the host fees they currently receive for waste imported from out-of-

county. To date, no disposal arrangements have been made beyond closure of the Scott County landfill.

As the disposal picture has unfolded in Scott County, they have become much more open to multi-county cooperation and the benefits it may provide. The Scott County Executive met with the County Executives from Campbell and Morgan Counties in August, 1996, and the three have scheduled another meeting for October, 1996. While no multi-county arrangements have yet emerged, they are considering potential benefits of cooperation.

Early in the planning process, there was a significant amount of conflict between the county and its municipalities. The town of Huntsville had a contract with a private firm for provision of house-to-house garbage pick-up in the city. When the Act was passed and counties were named the responsible unit for MSW management, Huntsville discontinued the service. The city viewed the Act as an opportunity for them to get out of the solid waste business and relinquish the responsibility to the county. The town of Oneida provided public collection services and have continued to do so after passage of the Act. One seat on the region board was reserved for a representative from Oneida, but the town has refused to fill the position and that seat remains vacant. The town of Winfield had a contract with a private firm for provision of household garbage pick-up prior to passage of the Act, and they have maintained this service. The town has one

representative on the region board and has cooperated with the county in developing the region's ten-year plan.

The Act requires that 90% of the residents of a county have collection service available to them. Scott County is meeting this requirement based on the presence of a number of small local private haulers. While collection service is technically "available" to any household willing to pay for it, disposal figures suggest that less than half of the generated waste is currently entering the stream of managed MSW. Scott County has received several grants for recycling equipment and plans to establish drop-off recycling centers. But to date, recycling opportunities are not yet in place, and Scott County has received an extension from the state to meet recycling requirements. No organized solid waste education efforts are yet in place, although the ten-year plan includes an education component. Whole tires, which are banned from Class I landfills by the Act, are shredded at the landfill by a state-contracted private shredder, and the shredded tires are then landfilled. There are no plans to deal with yard waste separately from MSW collected for disposal. In their five-year plan update required by the state to be submitted in April, 1996, Scott County reported that they have exceeded the 25% reduction goal set by the Act, however, the source of the reduction is unclear.

D. Lessons Learned

The theoretical model developed assumes that decision makers have a complete information set on which they base sound economic decisions, but the Scott County case provides evidence that this assumption may not be valid in all case. In the case of Scott County, it is clear that the region formation decision was made under the auspices of misinformation and a lack of education on the part of some decision makers. Although federal Subtitle D regulations were in place when the Act was passed (and even before the current landfill was purchased), there was a great deal of denial about the extent to which the regulations would be binding. Decision makers decided to form a single-county region under the assumption that they had long-term assurance of disposal capacity. Since decision makers appeared open to the concept of multi-county cooperation, as evidenced by passage of a resolution that allowed formation of a multi-county region in the future if they deemed it beneficial, it seems possible that a more fully informed decision process may have resulted in a different outcome. ✓

Scott County is a prime example of economics driving cooperation. Scott County elected to form a single-county solid waste region, and fully intended to handle solid waste management independently. But when their landfill began to (and continued to) operate in the red, they chose to accept costs associated with defacto cooperation that they had not previously been willing to accept. They chose to accept a loss of autonomy over their

landfill, and importation of out-of-county waste. In the Scott County case, however, it appears that this loss of autonomy was actually accompanied by a reduction in political risk. Prior to turning the landfill over to a private operator, the county landfill was operating at such a financial loss that very significant fee or tax increases would have been required to continue operation. Given a limited budget, and a wide variety of goods and services that it was required to produce, Scott County's budget constraint was binding for independent provision of solid waste management disposal services. Decision makers calculated that the potential political risk associated with large fee or tax increases outweighed potential political risk associated with the loss of autonomy. By introducing a third party private interest, the county was able to further reduce political risk associated with fee or tax increases by obtaining free disposal, which further offset losses due to the reduction of autonomy.

It does appear, however, that Scott County may have traded reductions in short run political risk for increases in long run political risk. While the disposal problem has been solved for the short run, with minimum political risk and reduced autonomy, it is likely that the level of political risk will reach an all-time high in the near future. When the current landfill extensions run out, the county will face landfill closure costs in excess of \$1.5 million. Additionally, they will cease to receive host fees, and will go from free disposal to no disposal, which is a problem that will likely be

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costly, both in terms of economic costs and political risk, to solve. In anticipation of this crisis, Scott County is now seriously considering cooperation with neighboring Campbell and Morgan Counties. Initially, Scott County felt that the transaction costs associated with cooperating with neighboring counties, each with their own ideas and plans for solid waste management, would be high, as confirmed by the previous quote of the Scott County Executive. As evidence of the change in attitudes with respect to cooperation, one local decision maker currently involved in the management of solid waste recently offered this assessment: "We have become aware that Campbell, Scott, and Morgan Counties are really a lot more alike than we thought, and we really need to be working together. We understand this now, but we just didn't see it back then."

One aspect of the decision process not previously discussed is that of timing, which appeared to significantly influence Scott County's decision. Education is a critical element in the process of cooperation, but education requires both time and effort. Decision makers must first realize potential benefits of cooperation before they may be weighed against often obvious barriers to cooperation. The time framed allowed for the decision gave little opportunity for education. The results of the needs assessment were presented in October, 1992, but no action was taken immediately due to anticipation of political changes pending the November elections. So once the political tides had settled, Scott County decision makers were left with

approximately one month to become educated about solid waste region requirements and region options, and to make a decision. In retrospect, it appears that education about the realities of current solid waste management has taken about five years, and is a continuous process.

4. INTER-LOCAL SOLID WASTE AUTHORITY

A. History and Background Information

The Inter-local Solid Waste Authority includes Giles County and Lincoln County, the city of Tullahoma, which is located in both Coffee and Franklin Counties, and Franklin County, except the city of Winchester. Recently, the city of Shelbyville, located in Bedford County, has also joined the Inter-local Solid Waste Authority. The counties and cities of the Inter-local region are located in the southcentral part of the state, with Franklin, Giles, and Lincoln Counties bordering Alabama. The region is predominately rural, with a large agricultural base. The region has traditionally been a large contributor to the state's livestock and crop production, but recently the region has also become a large nursery supplier. The location of the Inter-local Solid Waste Authority may be found in Figure 6, and selected characteristics of member counties and surrounding counties may be found in Figure 7.

When the Act was passed, Coffee County and Moore County had no landfill. Franklin and Lincoln Counties had landfills with little capacity, and



Figure 6. Inter-local Solid Waste Authority

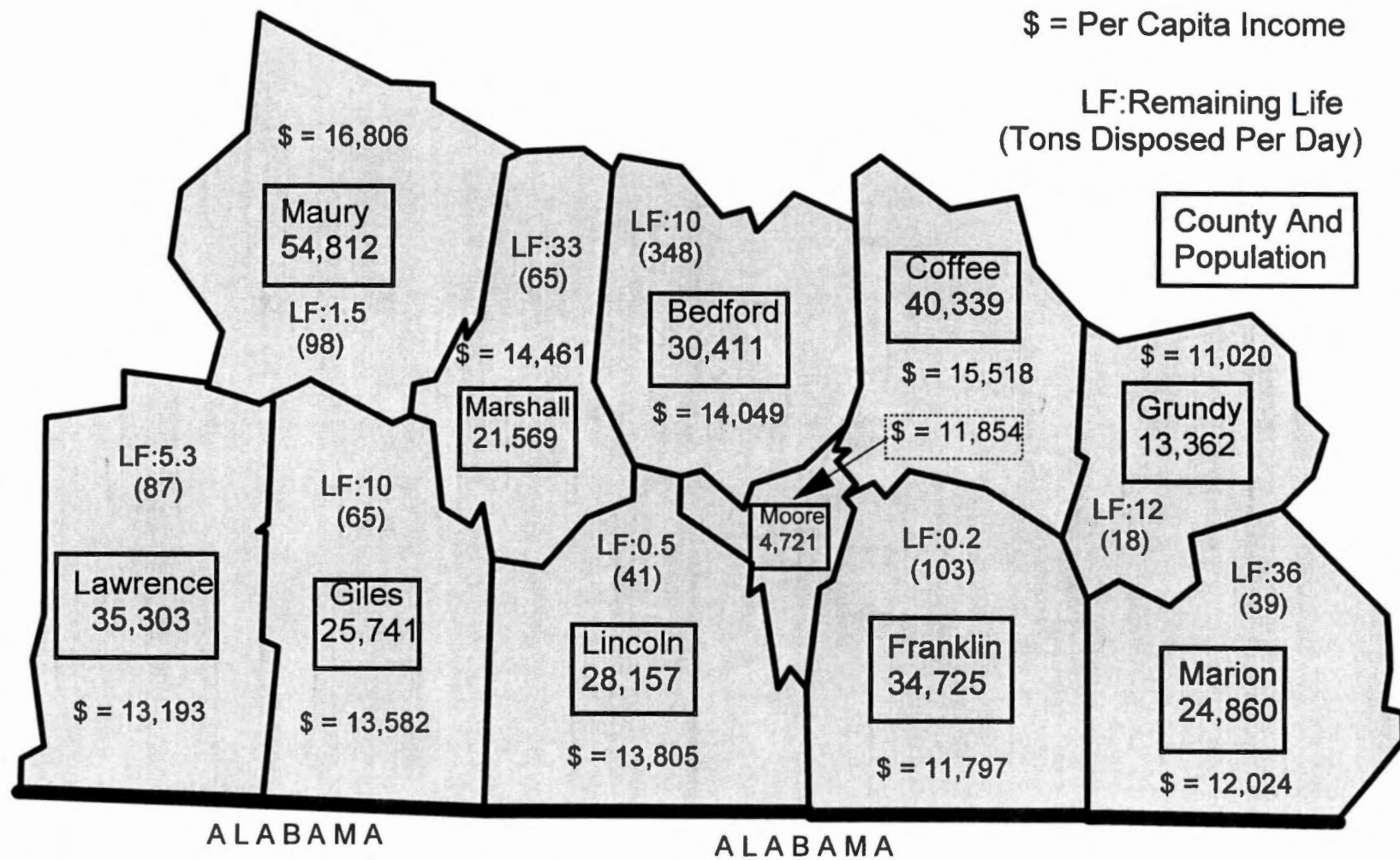


Figure 7. Characteristics of Counties in and Surrounding the Inter-Local Solid Waste Authority

decision makers had no inclination to finance bringing their existing capacity up to Federal Subtitle D standards by 1994. Giles, Lawrence, and Maury Counties had a landfill with at least some capacity and some potential to expand. Decision makers in these counties were inclined to make the financial commitment to meet Subtitle D standards by 1994. Large regional private landfills that had already publicly committed to conforming with Subtitle D standards were located in Marshall County and Bedford County. Both of these held a permit to obtain waste from an unlimited area.

In general, each of the 17 cities in the region handled collection in the city independently. Franklin County had a system of 12 attended convenience centers, and some green boxes, in addition to city service in Huntland, Decherd, Cowan, Estill Springs and Sewanee. Collection was available to 100% of county residents prior to passage of the Solid Waste Management Act. Residents of cities in Giles County (Pulaski, Minor Hill, Elkton, Lynnville, and Ardmore) paid a monthly solid waste fee for collection by the city of Pulaski and disposal in the Pulaski landfill. No collection service was available to the 41% of county residents living outside the cities. The cities in Lincoln County also contracted private collection services, and green boxes served the remaining 70% of county residents. A limited amount of recycling was available in the region, primarily through drop-off sites established and operated by individual cities.

B. Decision Process

Elected officials from Lincoln County, Fayetteville, Coffee County, Tullahoma, and Franklin County have long been interested in seeking a regional solution to their solid waste problems. For some, this interest dates back to the TERRA Incineration project of the Oak River Regional Resource Authority, proposed in the early 1980's. The proposal was to site an incinerator in Tullahoma. The authority received over \$2 million in interest-free loans and over \$1 million in grants from the state and the Department of Defense. But the project moved very slowly and eventually bogged down and fizzled out. Although the faces of many of the decision makers involved in the incinerator project had changed by the time the Solid Waste Management Act was passed, failure of the former project seemed to motivate many decision makers to push very hard for cooperation when the opportunity arose.

The Act was passed in May, 1991, and several county and city officials in the region began to consider cooperation immediately upon its passage, and even before the regional needs assessments were begun. According to those involved in early negotiations, the motivation for seeking a cooperative solution was purely economic. They all foresaw that solid waste management was about to become a really big and expensive issue, and were convinced that it would be prohibitively costly for each county to operate an individual Subtitle D landfill handling a low volume of waste. In

their opinion, the legislation just put parameters on what the region's task would be.

In December 1991, the Fayetteville City Manager and the Tullahoma City Manager requested a meeting with officials from Coffee County, Lincoln County and Moore County. After this initial meeting, Moore County failed to make a commitment to the regional concept and began to make plans independently. When Moore County elected not to participate, Lincoln and Coffee Counties asked representatives from Franklin County to attend their next meeting. In these meetings, they discussed specific criteria that each county would need to firmly commit to in order to participate in a multi-county region. The Coffee County Commission wanted to require that each county commit a bond in the amount of \$100,000, and each city participating independently of their respective county commit to a \$50,000 bond. While other participating counties felt this amount rather steep, they reluctantly agreed, reasoning that such a significant financial obligation showed a high level of commitment to the success of the regional effort. Other requirements for membership in the multi-county region included mandatory acceptance of a regional public landfill in their county, if this was revealed to be the most economically efficient solution and that site was selected as the most economically and geologically feasible site for the landfill. No member county could refuse to host a regional facility, if it was clearly in the best interest of the region. Another area addressed in these

early discussions was individual representation in the region. Each participating county and city in the region would have an equal number of representatives on the regional board. Representation was irrespective of population or size. Members felt that this assured fairness to all parties and prohibited larger counties and cities from taking advantage of smaller counties and cities. Decision makers felt strongly that all participants stood to gain economically from cooperation, even cities and counties generating larger amounts of waste, and that equality in the region irrespective of size was imperative for successful cooperation.

The participants then set a deadline, approximately March 1992, for each county to discuss alternatives and make a commitment. Entities making the commitment were Lincoln County, Franklin County, and Tullahoma. Since Tullahoma is located in both Coffee and Franklin Counties, they had the option to choose which of the two they wanted to be the responsible county, as allowed by the Act. When Coffee County refused to commit by the deadline, the region participants then began to consider other logical partners. One potential partner was Giles County, and a representative from Lincoln County approached officials from Giles County at the next scheduled development district meeting. Giles County had made no prior efforts to address the solid waste issue. Local leaders were very concerned about the expense of handling the issue alone and thus were very eager to join the multi-county region. It took Coffee County three

months to decide not to participate in the region, but took Giles County only two weeks to make the decision and go through all the proper channels (e.g., getting County Commission approval, making the financial commitment, etc.) to officially become a member of the Inter-local Solid Waste Authority.

The interested parties then drew up an agreement that had to be signed by all parties (the respective county commissions or city councils) to join the planning region, called the "Inter-local Agreement to Establish an Inter-local Solid Waste Cooperative Board." The inter-local agreement was actually signed by the last of the necessary parties on July 20, 1992. An "inter-local agreement" is a type of legal arrangement that allowed them to go ahead and start working cooperatively, although the state had not yet set up guidelines for forming an authority and although it was technically too early to form a multi-county solid waste region. The Act required that regions be formed between October and December, 1992. There was a resolution contained in the inter-local agreement that allowed the newly formed Inter-local Solid Waste Cooperative Board to automatically convert to a planning region and an authority when the time came. The inter-local agreement was a legal construct that allowed the region to fast-track forming an authority, and was operative for two years, or until an authority was formed. This also saved region members the inconvenience of going before each individual commission and council again; the board formed

through inter-local agreement was granted decision-making power.

Tullahoma only formally became an entity and a full-fledged member of the region, facing the same requirements as a county, when the actual authority was established in October, 1992.

Technical support in the decision making process was provided from several sources. The Southcentral Tennessee Development District solid waste consultant provided useful information that compared the cost of independent provision of disposal to regional provision of disposal. Simple handouts and hard numbers were critical in educating county commissioners and helping them understand the alternatives. Solid waste consultants with CTAS also provided cost information that influenced the decision of the counties. Perhaps the most important assistance the region received, however, was the expertise of the Municipal Technical Assistance Service (MTAS) legal counsel. At the time that the inter-local agreement was constructed, the Act and its requirements and implications were still not well-understood by many state agencies responsible for implementation. The MTAS legal consultant, working at the time with the cities of Fayetteville and Tullahoma, took the time and made the effort to dig into the law and understand the Act. She was responsible for "finding" the loophole that would allow them to begin work as a region (i.e., the inter-local agreement), and for drawing up the agreement. Everyone involved in the decision making that was interviewed felt strongly that having a legally

binding contract was paramount to the success of the region. If partners are required to make a binding commitment, they must be serious about solving a problem and saving money.

By forming a region of at least three counties, each county was eligible for the maximum planning grant, \$20,000. So, the combined planning grant for the region was \$60,000, instead of the combined grant of \$45,000 if each county had formed a single-county region and then pooled their resources. While the extra planning grant money was certainly a benefit of multi-county cooperation, the amount made it insignificant as a decision influence. According to one county commissioner involved in the decision process, "Once we [the county commission] realized what it was going to cost, especially if we were by ourselves, that extra money was just a drop in the bucket." The authority pooled the \$60,000 in planning grants with the \$350,000 initially guaranteed by each county and city (\$100,000 per county, \$50,000 per city) to cover feasibility studies, plan development, and other region expenses.

C. Organization and Activities

In October, 1992, the Inter-local Solid Waste Cooperative Board officially became the Inter-local Solid Waste Authority. The authority was formed according to Part 9 of the 1991 Act, and is thus a "Part 9 Authority", which grants the authority unprecedented autonomy and responsibility in order that regional solid waste management services may

be expedited, economized, and consolidated (TDEC, Div. of SWA, "Fact Sheet", 1995). A Part 9 Authority is an independent governmental entity with powers that include the right to (a) sue and be sued, (b) acquire personal and real property and exercise the power of eminent domain, (c) enter into contracts, (d) issue bonds, (e) incur debt, (f) employ agents and pay compensation to employees, (g) set tipping fees and surcharges, and (h) review permits for new facilities. An "advisory board" was formed that was composed of one representative from every entity involved in the authority. The official Authority Board of Directors was limited to 15 members by the 1991 Act, though the authority was composed of 17 local entities. So, one representative (a county commissioner, city alderman, city manager, or mayor) from each entity except two was officially appointed to the board. In practice, the Authority Board was a rubber stamp for votes and decisions made by the larger advisory board.

The first action of the board was to hire a consulting firm to perform feasibility studies to determine the most appropriate disposal solution for the region, and to develop a ten-year solid waste management plan for the region. The combined region produced 86,870 tons per year of MSW, or 348 tons per day (based on 250 disposal days per year). The consulting firm developed a cost and feasibility comparison of three alternative disposal scenarios: (1) the authority sites, builds, and operates a regional public landfill in the most economically and geographically feasible location, (2) the

authority contracts with a private firm to construct and operate a landfill in the region, and (3) the authority contracts with a private firm for transportation and disposal outside the region. Compliance with the Act required capacity assurance and planning for the next ten years. From its inception, though, the Inter-local region was looking for an even longer-term solution to waste management, and the criteria used by the consulting firm to compare alternative scenarios was disposal assurance for twenty years. After consideration of all relevant factors, the consulting firm selected five potential sites for location of a public or private regional landfill, with the first choice site located in Lincoln County, near Fayetteville. As is typically the case with siting a landfill, citizen emotions and involvement quickly reached a peak level. When this information was presented to the Authority Board, whose meeting happened to be in Fayetteville that evening, over 150 citizens were in attendance, and all were opposed to locating a regional landfill near Fayetteville. But the Authority Board, including representatives from Fayetteville held steadfast to the commitment to serve as host if they were fairly selected based on economic and geologic feasibility.

Because of the large volume of waste generated by the entire region, they were able to gain significant leverage in soliciting bids for private disposal and increased competition among potential private providers. The most economically feasible option was eventually shown to be a twenty-year contract with a large private firm for construction of one transfer

station in each county and one in Tullahoma, transportation, and disposal in the firm's private regional landfill outside the Inter-local Authority's boundaries. The disposal price is set for the next ten years. The private firm has the option of re-negotiation for the remaining ten years. Everyone involved in the process, including technical advisors, is convinced that the Inter-local Authority was able to negotiate a long-term solution much more cost effectively with a larger waste base than each member could have done individually. In fact, there has been evidence of at least one private firm trying to prevent region formation, in order to command a higher price for contracts with individual jurisdictions. When efforts of the private firm failed to prevent formation of the Part 9 Authority, the firm began to try to lure individual cities away from the region by promising very low disposal rates offered for short-term contracts. The Inter-local Authority is currently involved in a lawsuit against one municipality in Giles County that breached the contract negotiated by the authority when they signed a short-term contract with a competing firm. Although the small municipality does not generate a significant volume of waste, the authority feels that it is imperative for the future success of the region that each entity be bound by the decisions of the authority.

The Inter-local Authority is also open to accepting new members. Early in 1994, the city of Shelbyville, located in Bedford County, analyzed the cost of alternatives for providing MSW management, and came to the

Inter-local Authority expressing an interest in joining the authority. They were subject to the same commitments required by each original member, and officially became a member of the Inter-local Authority in March, 1994.

The activities of the Inter-local Authority extend beyond disposal assurance into all aspects of solid waste management. The authority recently hired a regional solid waste education coordinator to work with all 18 entities in the region. This person serves as a resource and provides support for individual education efforts in the region. The authority charges each member a fee of \$.49/ton to fund the regional education coordinator. Now that the disposal issue is settled, the authority is concentrating their efforts on recycling and are in the early stages of developing a regional recycling plan. They see potential advantages in marketing their recyclable products by pooling their tonnage, but a regional MRF does not seem economically feasible at this point. They are also focusing attention on the possibility of a regional composting project but have no definite plans yet. There are still some aspects of solid waste management that seem most efficiently handled by individual entities. Each jurisdiction in the authority is responsible for collection and transportation to the nearest transfer station. Disposal of tires is also handled individually by each county, but the authority is looking at alternatives for a more economical regional solution for management of waste tires.

D. Lessons Learned

The case of the Inter-local Solid Waste Authority provides a stark contrast to the cases previously presented. The most striking difference is the pro-active role the authority assumed in all aspects of solid waste management. Even before all of the state's guidelines were in place, the authority, then working as a cooperative board, had already made significant progress toward regional cooperation. One factor that contributed toward the success of the region was past experience in solid waste cooperation, even though the cooperative effort actually failed. In fact, failure of past efforts may have made decision makers even more committed to ensuring successful cooperation when the opportunity arose. Sometimes, knowing what *not* to do may be just as important as knowing what to do, and the previous failure of the incinerator project provided decision makers with knowledge of some of the factors that contribute toward cooperation failure. Those involved in the earlier project knew how important it was to keep the project moving and resolve conflicts in a timely manner.

Another factor that contributed to successful regional cooperation was the presence of cooperation entrepreneurs. The Fayetteville City Manager and the Tullahoma City Manager played crucial roles in cooperation success by devoting significant amounts of time to conflict resolution and progress of the region. Often, it is county commissioners or city councilmen

who are ultimately responsible for making decisions about solid waste management. Most of these, though, are not career public servants, but have outside, demanding jobs and serve the county or city interests in their spare time. As evidenced by the former failure of the incinerator project in the region, small amounts of continual progress are required for long-term regional success. These cooperation entrepreneurs facilitated establishment of a cooperation infrastructure. When problems or questions arose, they served as a foundation for the region where such issues could be immediately addressed, instead of having to wait as long as a month for the next commission or council meeting. Another contribution of the cooperation entrepreneurs was to provide a persistent source of education among changing faces of decision makers. As the faces of elected officials change, it is necessary to continually educate them about why and how certain decisions were made. A persistent source of re-education is required to bring new players up to speed on the economics behind alternatives chosen and alternatives not chosen.

Having a tight legal construct that binds all members to agreed-upon terms was critical to the Inter-local Authority's success, in the opinion of those involved in the process. And in retrospect, requiring a substantial financial obligation by all participants really solidified the commitment of each partner to region success. From its inception, the focus of the Inter-local region has always been a long-term solution to solid waste

management. Requiring a binding commitment of any potential member was symbolic of the long-term vision. It is important to note, however, that this would have been impossible to achieve without the legal expertise of the MTAS legal consultant who invested considerable time and effort required to interpret and understand the law and its implications. While the initial price of developing a legally binding authority was high in terms of transaction costs, i.e., it required significant legal expertise, and involved a considerable amount of negotiation on the part of decision makers involved, it actually reduced transaction costs in the long run. These initial transaction costs were largely offset by MTAS resources, or an independent third party broker without a direct stake in the outcome or its implications. Once the authority was in place, it established the institutional arrangements necessary to facilitate progress toward cooperation.

The previous two cases provided examples of how a private third party may be able to reduce transaction costs and political risk associated with cooperating. A private firm's focus on profit maximization may lead them to foster informal cooperation. The Inter-local case, however, illustrates another aspect of the involvement of a private profit maximizing firm. A private interest may either facilitate or impede cooperation, depending upon the outcome with respect to private industry's profit maximization objective. While they may benefit from facilitating informal cooperation, they may see disadvantages in formal multijurisdictional

cooperation in municipal solid waste management. When local entities band together formally, they may be able to gain significant leverage in negotiating with private firms. It would be advantageous for a private firm to keep local jurisdictions independent and negotiate separate short-term contracts. When local entities form a unified front, they may also be able to gain significant leverage in influencing policy. Strong local regions may be able to exercise flow control, or even influence policy makers to develop legislation or regulations that allow them more authority or leverage. It is likely that if local jurisdictions do not organize and influence regulations in a manner advantageous to them, private industry will organize and attempt to influence them in their favor.

Almost everyone interviewed regarding this case remarked that they were very pleased with the outcome of regional cooperation in MSW management. They believe they were able to negotiate a disposal contract that would otherwise have been unachievable. They also feel like benefits may be gained in the future through cooperation in other aspects of solid waste management, as these programs begin to develop. Further, the region partners expressed that everything is now in place to facilitate cooperation in other matters outside solid waste management. The initial investments in terms of transaction costs and political risk that were required to establish a regional cooperative effort in MSW have produced externalities including trust among members, shared vision, and comraderie.

If a proposal regarding another issue were to come along in which all potential partners could see tangible benefits of cooperating, as in the case of solid waste, development of a cooperative relationship would be much easier and more efficient.

5. SOUTHEAST TENNESSEE SOLID WASTE REGION

A. History and Background Information

The Southeast Tennessee Solid Waste Region is comprised of the ten counties that are members of the Southeast Tennessee Development District: Bledsoe, Bradley, Grundy, Hamilton, Marion, McMinn, Meigs, Polk, Rhea, and Sequatchie Counties. The region is very diverse in terms of population, geography, rurality, and economic activity. A map of the region location may be found in Figure 8, and Figure 9 highlights selected characteristics of each county. The city of Chattanooga is located in Hamilton County and has a population of 152,466. Hamilton County in the Southeast Tennessee Region is part of the Chattanooga Metropolitan Statistical Area (along with three north Georgia counties), which has a population of 399,487. Counties in the region range from very rural Sequatchie, Bledsoe and Polk Counties to metropolitan Hamilton County, with several counties such as Bradley, McMinn, and Marion containing a rural/urban mix.



Figure 8. Southeast Tennessee Solid Waste Region

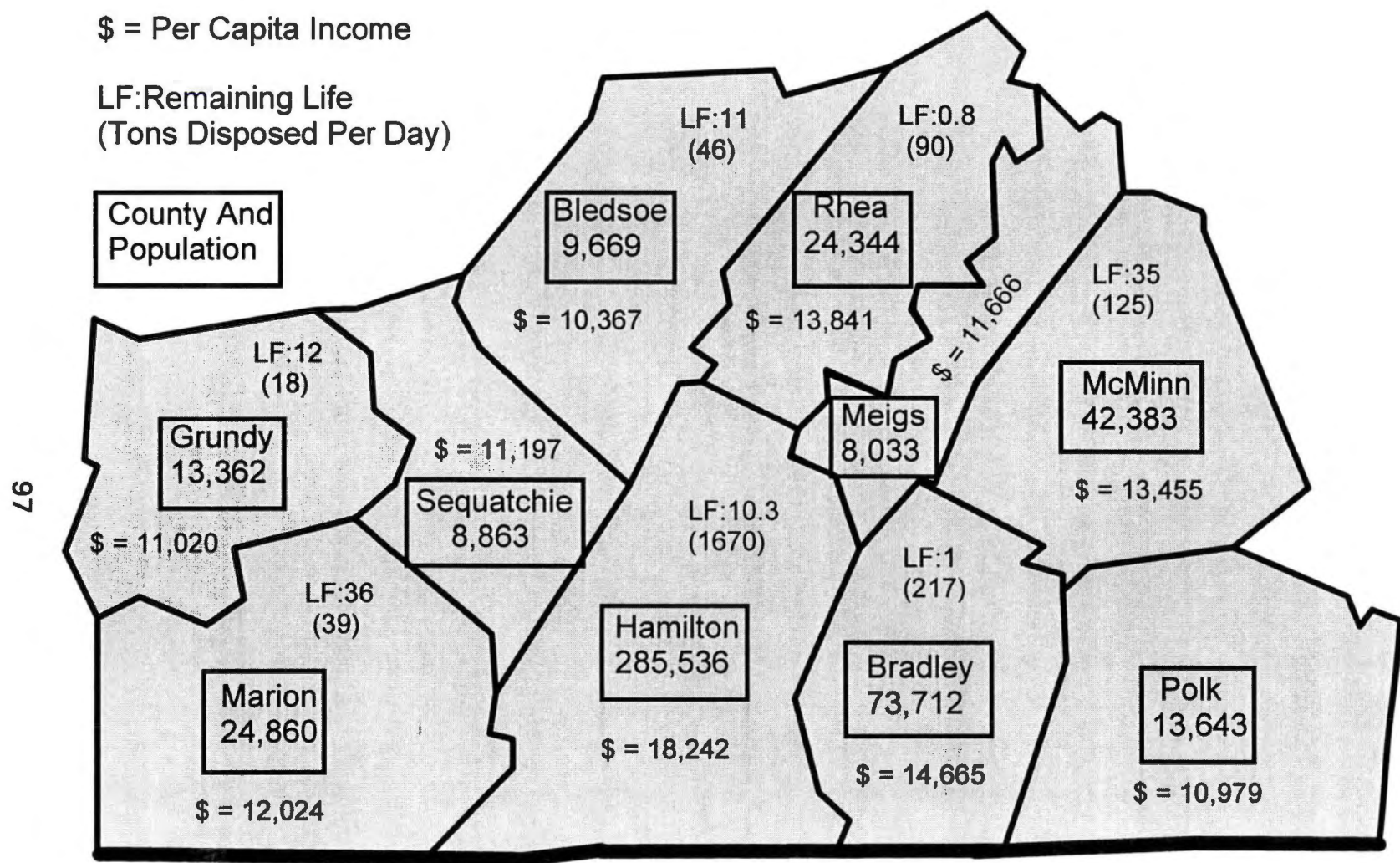


Figure 9. Characteristics of Southeast Tennessee Solid Waste Region.

Prior to the passage of the 1991 Solid Waste Management Act, the status of waste management activities in the region varied greatly. On one end of the spectrum, Hamilton County produced almost 1,800 tons per day of MSW and had a private Subtitle D landfill, curbside garbage collection for almost all of its residents, curbside recyclables collection for many of its residents and drop-off recycling available elsewhere, a full-time solid waste director, and a full-time recycling and waste education director. On the other end of the spectrum, Grundy County produced 18 tons per day of MSW and operated a small public landfill that did not meet Subtitle D regulations. Grundy County provided green boxes for drop-off collection of garbage with no opportunity to recycle. The remaining eight counties had a solid waste management program somewhere between Hamilton County's and Grundy County's. Three of the ten counties (Meigs, Polk and Sequatchie) did not have a landfill. Six of the counties had landfills, but all were scheduled for closure by March of 1994, when Subtitle D regulations were originally scheduled to become effective. Of these six counties, Bradley and McMinn had already applied for permits for construction of a new Class I landfill compliant with Subtitle D.

The relationship among counties in the Southeast Tennessee Development District (STDD) is rather unique. Development district boards are comprised of the county executives from each member county, and each member (and thus each county) has equal representation on the board.

Prior to passage of the 1991 Solid Waste Management Act, all counties in the STDD had a very good working relationship and were closely tied through the development district. The overarching theme in the STDD can be compressed into, "What's good for Chattanooga is good for all of us, and what's good for any county is good for Chattanooga." The development district Director and Assistant Director have been in place for over 15 years, and have gained the trust and respect of all member counties. In fact, more than one district county executive described the development district director as, "a conflict resolution genius." Elected officials in the member counties view the STDD as a resource that has the staff and expertise to provide sound advice and services that each county can't provide individually.

One example of the cooperative spirit among STDD member counties is the recent siting of a bridge across the Tennessee River. The Tennessee River passes through five counties in the STDD (Marion, Hamilton, Rhea, Meigs, and McMinn), and the state agreed to fund construction of a bridge in one of the five counties, on the condition that the five counties could agree where the bridge should be placed. For most counties, such a condition would not easily be met. Through STDD negotiations, however, the five counties were able to meet and agree upon the site of the bridge within one month. They even negotiated a package deal which included a guarantee for state funding of a second bridge in the region within the next

five years. Another cooperative project currently under development is a regional water system, whereby all of the utility districts in the region will be linked. In addition, several joint economic development projects have been undertaken.

B. Decision Process

Even before passage of the 1991 Solid Waste Management Act, the solid waste issue had been a topic of much discussion in STDD monthly board meetings. The STDD staff had been watching the development of the legislation closely and made each county executive aware of likely changes they would face in the future management of MSW. Once the legislation passed and the state notified each county executive of specific requirements of the Act, the first reaction of each county executive was to put this on the agenda for discussion at the next STDD Board meeting.

At this meeting of the STDD Board, they discussed requirements of the Act and alternatives allowed under the Act. Upon counsel from the STDD staff, they all agreed that this issue could best be handled as a group, rather than individually. Several factors contributed to this decision. First was the economics of solid waste disposal. Most of the county executives that currently operated a small public landfill not compliant with Subtitle D were convinced that it would be nearly impossible for each of them to continue to provide disposal individually. Another factor was the planning grant incentive to form multi-county regions. Each county knew that it

would be difficult to have a plan completed for \$15,000. But if they pooled their resources as a multi-county region, they would have \$200,000 and would be able to hire an outside consultant to develop the plan. Perhaps the most significant factor, however, was encouragement from development district staff who assured them that forming a multi-county solid waste region was in their best interest and they could make it work.

One way the development district staff was able to help make the region work was through modification of the generic resolution drafted by the state to establish a multi-county solid waste region. For the region to work effectively, each county had to view membership in the region as a win-win situation. They had to be able to see tangible benefits of cooperation, but not at the cost of losing control over their destiny. Over the course of several months early in 1992, the resolution for formation of a multi-county region underwent numerous changes as necessary to allow compromises. The resolution was amended to emphasize that each county in the region would not be required by the region to do anything that was not in the county's best interest. The final result was a rather loose arrangement that allowed each county to retain ultimate control of solid waste management in their county.

Once an acceptable resolution was drafted, the county executives, along with the STDD staff, began to "sell" the idea to each individual county commission, which was required to approve the resolution. County

executives cited two factors that were of critical importance in selling the region to individual county commissions. The first was a set of handouts developed by the development district, with help from CTAS, that very simply showed realistic projected future costs of handling solid waste independently in a manner compliant with federal and state regulations. Presenting economic benefits in a two-page summary written in easily understood language was a very effective strategy for quickly educating local decision makers of the task before them. The second factor was assurance by the individual county executive and development district staff that passage of the resolution would not usurp any local control. Local officials were assured that they could not be forced by the region to do anything they didn't judge to be in their best interest.

Most counties in the region agreed to the resolution relatively quickly and with relatively little controversy. The last county to agree to join the region was Marion County. At the time the Act was passed, Marion County had a landfill that handled 39 tons per day with a remaining life of 36 years, but was not compliant with Subtitle D. There was a great deal of denial about Subtitle D regulations, so it was very difficult to convince citizens and local decision makers that their disposal situation was not under control for the next 36 years. Another factor that led to controversy over joining the region was past experience with a large private company that wanted to construct a hazardous waste incinerator in the county. Due to the earlier

controversy, citizens were intensely opposed to importing waste into the county, and it required a great deal of education to convince them that membership in the region was not equivalent to importation of waste. After considerable educational efforts, the county passed the resolution and completed the ten-county Southeast Tennessee Solid Waste Region.

Benefits to many of the smaller counties that were facing major, expensive changes in the area of solid waste management are relatively straightforward. Small counties stood to gain from regional cooperation by potentially reducing the cost of disposal, affording a professional consultant to develop their ten-year solid waste plan, or potentially gaining a market for recyclables, to name a few areas. Hamilton County, on the other hand, already had a well-developed solid waste management program and had the staff and technical expertise to develop a ten-year plan, so it is more difficult to see the benefits to the largest county in the region of joining nine other smaller counties that would likely draw resources away from them. In the opinion of Hamilton County and Chattanooga decision makers, cooperative solid waste management was more a policy issue than a solid waste issue. Economic development in Chattanooga and Hamilton County is in large part dependent upon economic stability in surrounding counties. Since Hamilton County already had solid waste management under control and since the region couldn't force any undesirable solutions upon them, they viewed cooperation as a win-win solution because other counties

"win" by drawing upon the resources of Chattanooga and Hamilton County in managing their solid waste without harming Chattanooga or Hamilton County, and Chattanooga and Hamilton County "win" not in the solid waste issue, but in the future economic viability of the entire "Chattanooga region".

According to state guidelines, regional solid waste boards were limited to a maximum of 15 members. The Southeast Tennessee Solid Waste Regional Board was designed to work closely with the STDD. The board is composed of nine county executives (which is 90% of the STDD Board membership), three city representatives (one from Chattanooga, one from Cleveland in Bradley County, and one from Pikeville in Bledsoe County), and three city managers selected by the city manager's association (one from Athens in McMinn County, one from Signal Mountain and one from Red Bank, both in Hamilton County). The one county without representation from the county executive is Bledsoe County, which is the reason for appointment of a Pikeville representative. Solid waste regional board meetings were generally scheduled to coincide with STDD Board meetings at the site of the STDD office in Chattanooga.

C. Organization and Activities

The resolution creating the Southeast Tennessee Solid Waste Region was not intended to form a tight legal bond among all ten counties. The intention of member counties forming the region appeared to be (1)

cooperation in developing a ten-year plan, and (2) cooperation in certain aspects of solid waste management that were agreeable to all entities. The intention was not for all ten counties to cooperate in joint disposal. In the area of disposal, several "mini-regions" have been created within the Southeast Tennessee Region, with the economics of solid waste disposal driving the decisions to cooperate. One example is McMinn, Meigs, and Polk Counties. When Subtitle D regulations were enacted, McMinn County negotiated an arrangement with Meigs County and Polk County to accept their waste for disposal in a Subtitle D landfill. They expect the current arrangement to ensure disposal capacity for all three counties for the next 20-35 years.

Another mini-region for disposal is composed of Marion, Grundy, Bledsoe, and Sequatchie Counties. As previously noted, Marion County had a large landfill not compliant with Subtitle D prior to passage of the 1991 Act. When Marion County realized that they were facing tremendous costs to close the landfill in 1994 and would be required to find an alternative disposal solution, they were forced to consider importation of out-of-county waste. By accepting all the waste they could, from both private sources and other counties, they were able to fill up the existing landfill quickly and raise funds to close the old landfill and construct a new Subtitle D landfill. After successfully operating as a defacto region, Marion County plans to

continue to accept waste from Grundy, Sequatchie, and Bledsoe Counties at the new Subtitle D landfill.

A major selling point of the regional concept was that no county could be forced to manage waste in a manner inconsistent with their objectives or desires. One evidence of this is the disposal situation in Rhea County. Rhea County generates approximately 90 tons per day for disposal, and operated a public landfill until it was forced to close in 1996 due to noncompliance with Subtitle D regulations. McMinn County offered to allow Rhea County to export waste to McMinn County's Subtitle D landfill. However, Rhea County felt very strongly that it was imperative for them to have their own landfill. They were also strongly opposed to importing out-of-county waste. Rhea County is currently in the process of obtaining a permit to construct and operate a Subtitle D landfill in their county able to handle their 90 tons per day for the next 20 years. Most estimates project that it will cost Rhea County nearly \$60 per ton to dispose of waste at a new county landfill, opposed to the offer for disposal in McMinn County's landfill at a price of \$35 per ton. Other members of the region, however, support the decision of Rhea County, and feel like it is their prerogative to handle disposal in the manner they view as most appropriate. Disposal flows for MSW in the Southeast Tennessee Solid Waste Region are shown in Figure 10. The region is currently served by five Subtitle D landfills, two of which are regional in nature. Several counties within the region are also

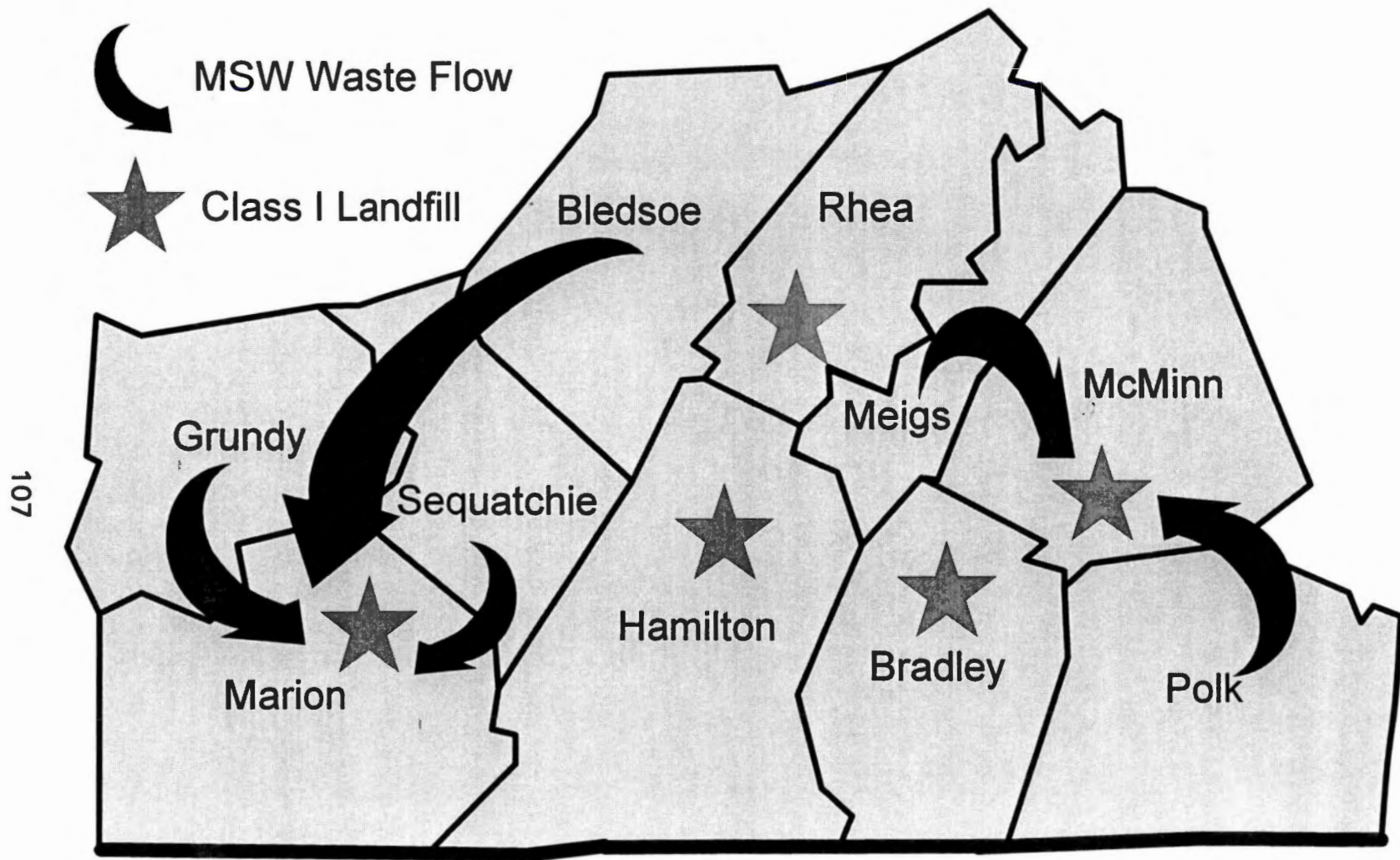


Figure 10. MSW Disposal Flows in the Southeast Tennessee Solid Waste Region.

cooperating in disposal of Class III/IV wastes, and these flows are depicted in Figure 11.

Collection of waste has been left up to each individual county. The status of collection efforts in the region is portrayed in Figure 12. Two counties, Hamilton and McMinn, are serviced entirely by either public or private collection. In all other counties except Rhea and Grundy, at least some collection is provided, usually by cities and sometimes by a small private collector. Populations not serviced by pick-up have drop-off convenience centers available to them. While collection of recyclables has been left up to individual counties, the region has worked cooperatively to process recyclables and market them. The Orange Grove Recycling Center is a non-profit MRF located in Chattanooga. All participating counties donate collected recyclables to the MRF where they are processed and marketed. The region is currently working on a data base for industrial recycling, both end users and suppliers. Figure 13 portrays recyclables collection in the Southeast Tennessee region. One area of solid waste that has yet to be fully addressed is solid waste education, although the region plans to handle education on a region-wide scale. They plan to pool state educational grants to hire an education coordinator for the entire region, and use region-wide media outlets to disseminate information.

Regional ties have afforded opportunities for informal cooperation in several areas. One example is tire disposal. A private firm located in

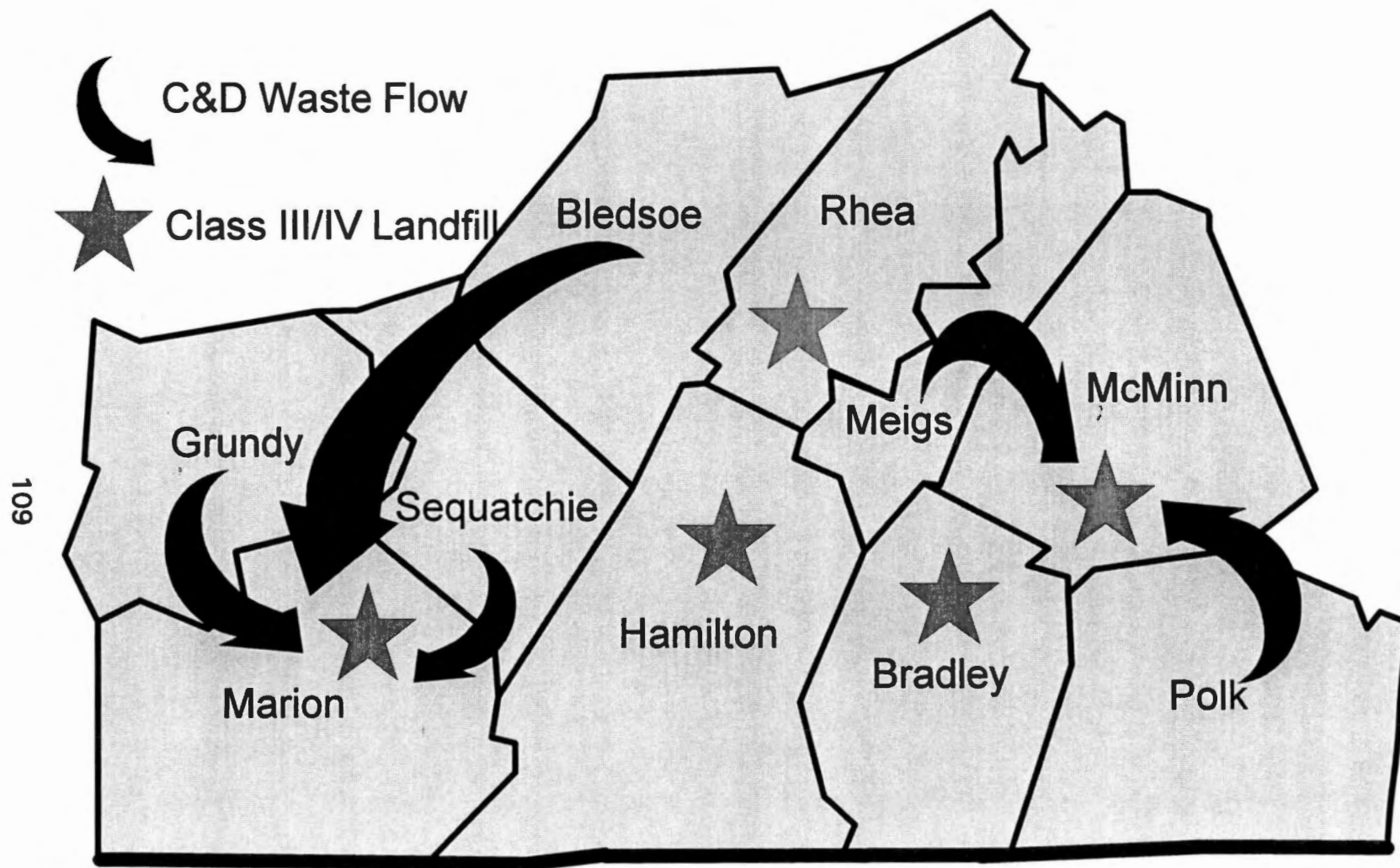


Figure 11. Class III/IV Disposal Flows in the Southeast Tennessee Solid Waste Region.

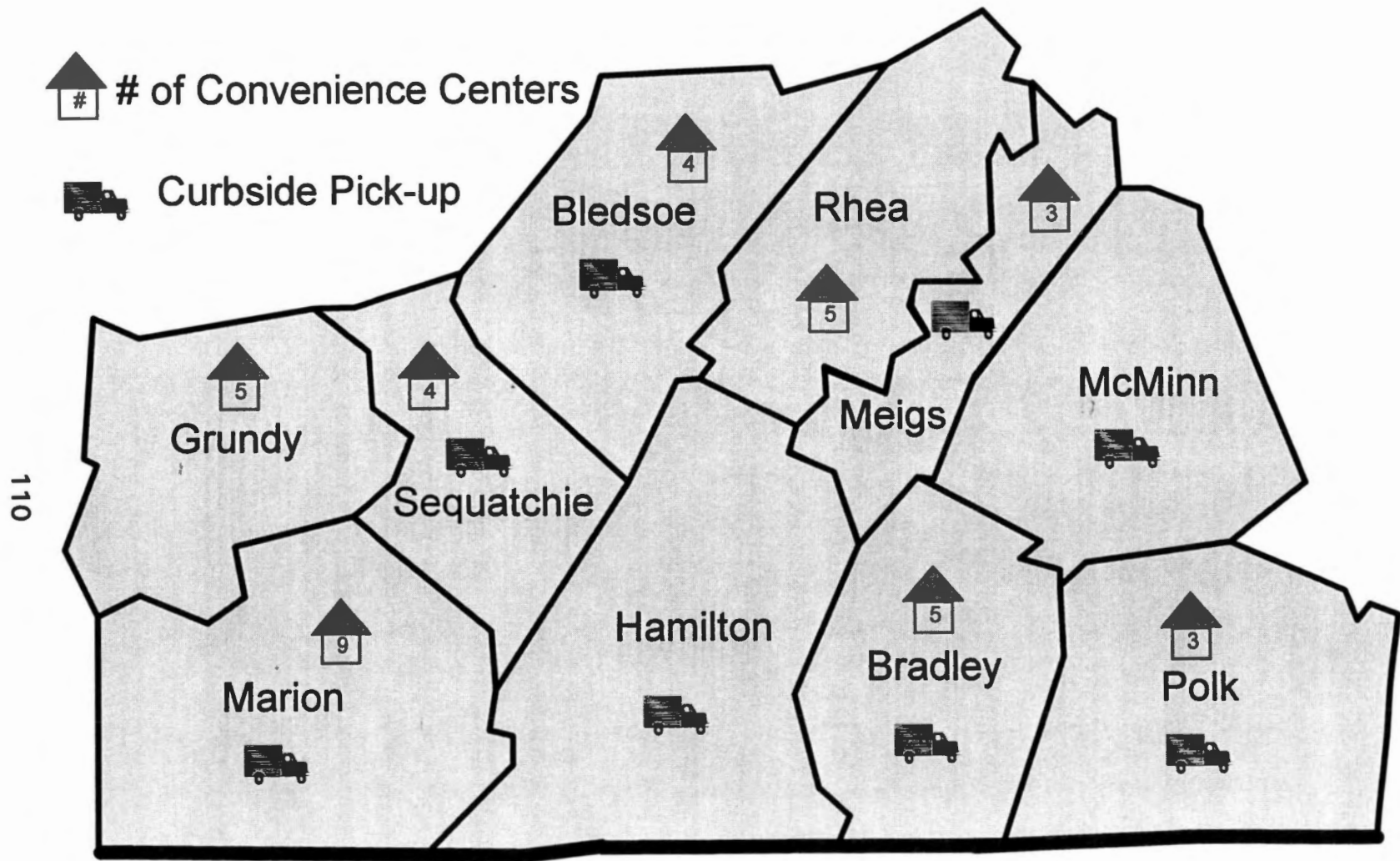


Figure 12. Collection Efforts in the Southeast Tennessee Solid Waste Region

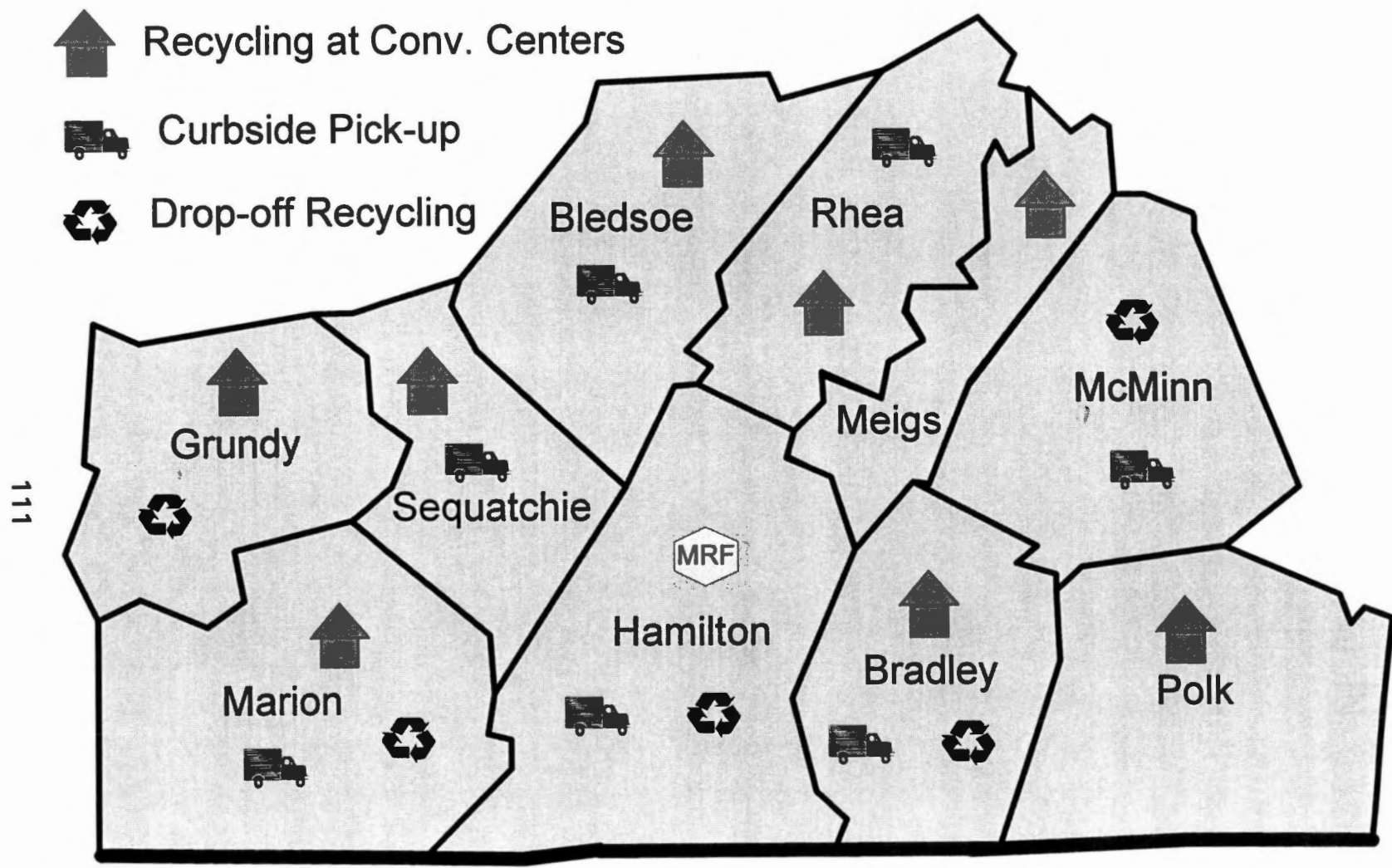


Figure 13. Collection Efforts in the Southeast Tennessee Solid Waste Region

Bradley County approached the McMinn County Executive and asked if they would consider a tire disposal contract, which they eagerly accepted.

Through the McMinn County Executive's involvement with the regional board, he was aware that Marion County was having a problem with tire disposal. So he contacted the Marion County Executive and informed him of the Bradley County-based company looking for tires. Within a few days, Marion County also had their tire problem solved.

D. Lessons Learned

Success of the Southeast Tennessee Solid Waste Region is largely a result of previous cooperative relationships through the development district, and trust earned through a long relationship between the development district and its member counties. The driving force behind cooperation in this case is not a cooperation entrepreneur, or individuals with a stake in the problem who facilitate establishment of a regional infrastructure able to accommodate the process of cooperation, as in the Inter-local case. The driving force, or rather the glue that helped form the region and hold it together was the development district, which served as a "cooperation cornerstone", or a continual, steady base upon which cooperation was built. This case seems to pick up where the Inter-local case ended. Trust and confidence, comraderie, and strong ties were already in existence in the STDD prior to passage of the Solid Waste Management Act in 1991.

One would expect that such a large number of counties, with diverse characteristics and significant distance among them, would face significant transaction costs associated with developing relationships necessary to facilitate multi-county cooperation. However, when the opportunity arose to cooperate in MSW management, counties in the STDD faced much lower transaction costs than many other counties considering cooperation. Many of the transaction costs required to cooperate in solid waste management had already been invested in the development district through cooperation on previous issues. The relationship established in the development district also lowered the political risk associated with multi-county cooperation. But this relationship that was previously established only existed because member counties had been willing to give up some local autonomy and had been willing to increase their level of political risk at some prior time to establish development district relationships.

Additionally, members of the Southeast Tennessee Solid Waste Region were able to educate individual decision makers about the economic implications of the new federal and state regulations more quickly, and with greater confidence in the estimates, because the source of the information, the development district, had already gained credibility with individual counties in other matters. Also, as newly elected leaders take office, re-education is necessary, and it requires a standing, unchanging force like the development district to provide continual education and consistency.

Generally, the benefits of cooperation have been identified as a form of potential cost savings. Another benefit of cooperation not previously noted is that identified by Chattanooga: future economic stability in the surrounding region and an economic environment in the entire region that will help promote the future interests of Chattanooga. Although they did not receive a direct benefit from cooperation among all ten counties, they viewed cooperation as a Pareto improvement for the region as a whole. At least one member was made better off without making them worse off, so the move was optimal for the development district as a whole. Beneficiaries of direct economic benefits were counties like Bledsoe and Sequatchie. As the private consulting firm was developing the regional plan, Bledsoe and Sequatchie wanted to explore the possibility of siting a joint landfill in Bledsoe County. So the consultants conducted a feasibility study and found that it would be prohibitively costly. But without cooperation and the expertise of a consulting firm at their disposal, Bledsoe and Sequatchie Counties would probably not have been able to undertake such a feasibility study, on which they were able to make sound economic decisions about the management of solid waste in their respective counties.

Two factors seemed to be crucial in "selling" cooperation to individual county commissions and local decision makers. One was the flexibility allowed by the resolution forming the region. Through the development district, county executives had been able to draft a resolution that allowed

cooperation as a multi-county region, but also allowed individual decision making, and essentially gave each county veto-power in their county.

Successful inclusion of such flexibility again may be attributed to confidence and trust in the development district and their ability to "look out for" each member. Another selling point was quick, simple education of local officials. Seeing the benefits in hard numbers in a simple format, and from a credible source, facilitated cooperation.

While the situation in the STDD has proven beneficial for members faced with solid waste management requirements, and has facilitated cooperation in solid waste management, as well as other areas, it is important to examine the stability of the development district relationship. Further questioning about the trust and confidence in the development district revealed that the root of the trust and confidence is not the development district, but the development district director. This individual has been able to provide a base of support for all counties and has been able to consistently help in resolving conflicts among member counties. When interviewees were asked what would happen to the Southeast Tennessee Solid Waste Region if the development district director was to leave his post of 15 years, all but one responded that it would likely remain intact until the next election, and then probably cease to exist.

6. BENTON-CARROLL-HENRY SOLID WASTE REGION

A. History and Background Information

Benton, Carroll and Henry Counties are located in Northwest Tennessee, as shown in Figure 14. Selected characteristics of each county are shown in Figure 15. The eastern border of Henry and Benton Counties is the Tennessee River, and recreation associated with the river is a major feature of both counties. Paris Landing State Park is located in the northeast corner of Henry County, and the county seat is Paris, home of the world's largest fish fry. Nathan Bedford Forrest State Historic Area is located in central Benton County, along the river, and the county seat is Camden. The county seat for Carroll County is Huntingdon, located in the center of the county. Carroll County is home to half of the Natchez Trace State Park and Forest, in the southeast corner of the county. Agriculture is a prominent feature of all three counties.

The county executives in the three counties have been active members of the West Tennessee County Executive Committee, which is composed of 20 rural counties in West Tennessee. Through this committee, the executives had regular contact and had formed a working relationship. Prior to the solid waste issue, Benton, Carroll and Henry Counties had formed a tri-county industrial region, but relatively little was accomplished through this venture.

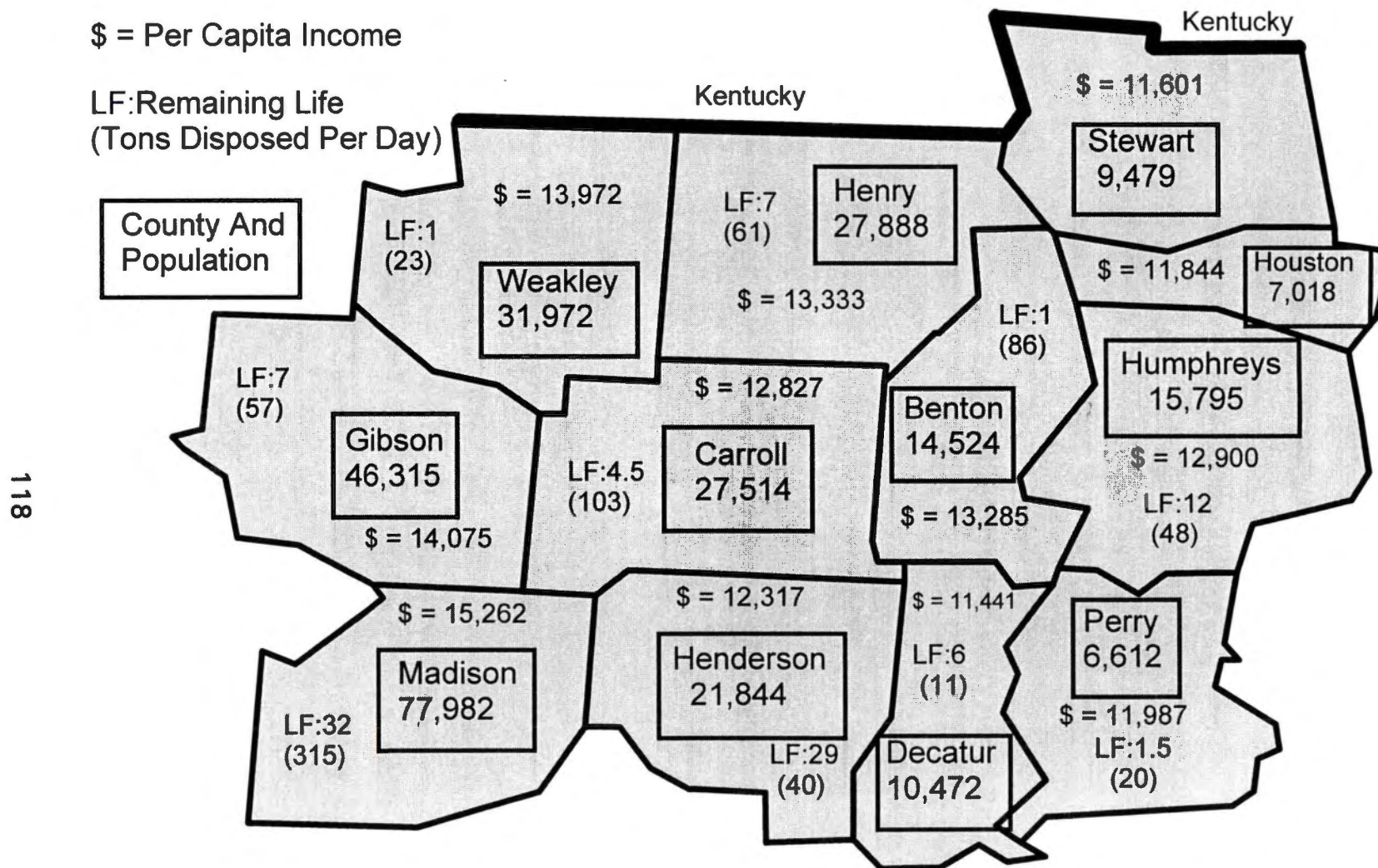


Figure 15. Characteristics of Benton, Carroll, Henry, and Surrounding Counties

Solid waste had been an active issue in the region even before the 1991 Solid Waste Management Act surfaced. In the early 1970's Henry County constructed a landfill and contracted a private firm for collection and disposal. This landfill was in addition to an existing landfill owned and operated by the city of Paris. There were constant complaints about the landfill, and citizen pressure forced its closure in the late 1970's. This left Henry County with nowhere to dispose of MSW, so they negotiated an arrangement with the city of Paris for disposal. This arrangement continued until Subtitle D regulations were enacted and it became apparent that the Paris landfill would have to close. The city of Paris was interested in building a new Subtitle D landfill.

Carroll County faced a very similar situation. They were serviced by a small public county landfill that was nearing capacity and would be forced to close in 1994 under new Subtitle D regulations. In 1989, they approached the county executives of Weakley, Crockett, Henry, Benton, Henderson, and Decatur Counties individually through the West Tennessee County Executives Association about the possibility of regional cooperation in siting a new Subtitle D landfill in Carroll County, but were never able to move beyond initial interest. At the time, Carroll County had a strong desire for a landfill in their county, but realized that future landfills would have to draw from a larger waste base to operate at a level near minimum average cost. The lack of initiative on the part of neighboring counties was due to

the short-sighted view of solid waste disposal at that time. Counties approached by Carroll County already had a disposal arrangement in place, and the Solid Waste Management Act had not yet been drafted. Since there was no disposal crisis at this point, there was no incentive to address solid waste disposal pro-actively.

Benton County had operated a public landfill that was also facing eminent closure due to Subtitle D. Prior to 1990, the county executive of Benton County persuaded the county commission to purchase a 500 acre tract for development of a new Subtitle D landfill, but the county executive did not seek re-election in the 1990 election. When the new executive and commissioners took office in 1990, two developers from Benton County approached the County Commission and offered Benton County ten years of free disposal (up to 75 tons per day) if they would grant them a permit to purchase the land and develop and operate a landfill at the newly-acquired site. With this agreement in place, Benton County felt that they had disposal assurance in place when the 1991 Act was passed.

B. Decision Process

When the district needs assessment was completed, the Northwest Tennessee Development District (NTDD) presented their findings to Benton, Carroll, and Henry Counties and recommended that they consider forming a three-county solid waste region. Staff of the NTDD emphasized that forming a region only required formation of a joint plan. They would be able

to cooperate in selected areas if it proved mutually beneficial, but would in no way be required to cooperate if they found it was not in their best interest. They also emphasized that Carroll and Henry Counties had a common disposal problem and all three counties had a common collection problem, since most cities inside the counties provided public or private household collection, but none of them had county-wide collection in place. Another factor considered was that the \$60,000 they could receive in planning grants would afford them a private consultant to handle feasibility studies and plan development. They also emphasized that it may be easier to meet the 25% waste reduction goal with a three-county region than it would be for each county to meet the goal individually. Additionally, statutory language in the Act encouraged multi-county cooperation, and so did other technical advisors outside the NTDD, such as CTAS consultants.

Based on the recommendations of development district advisors, decision makers in each county saw potential benefits of cooperation as a three-county region, so they went to their respective county commissions for approval of a resolution creating the Benton-Carroll-Henry Solid Waste Region. Carroll and Henry County commissioners saw that they had a common collection and disposal problem, knew they would not be able financially to construct and operate a Subtitle D landfill independently, and voted for the resolution with little debate. Benton County, however, viewed their disposal problem as solved, and as a result, they were more hesitant to

form a three-county region. Further encouragement from technical advisors, however, led to passage of the resolution, after they were assured that (1) formation of a region did not allow unwanted waste management practices to be forced upon them, and (2) they stood to gain financially by planning jointly and potentially by solving the collection problem jointly. The newly formed Benton-Carroll-Henry Solid Waste Region then formed a nine-person board, made up of three elected officials representing each of the three counties (either county executives, mayors, county commissioners, or city aldermen).

C. Organization and Activities

Once the region was formed, Carroll and Henry Counties hired a private consulting firm to conduct a feasibility study to examine the possibility of jointly siting a Subtitle D landfill to handle both counties' MSW. The study showed that unless they could import additional waste, the cost of developing and operating a Subtitle D landfill for the 172 tons per day produced by Carroll and Henry Counties would be in excess of \$50 per ton. They then requested proposals for private bids for disposal services for the two counties, and were able to negotiate a ten-year contract for a private firm to operate a transfer station in each county and haul to their private landfill in Obion County for disposal at a price of \$21 per ton. The city of Paris decided to negotiate an independent contract for a transfer station at the site of the closed Paris-Henry County Landfill and private disposal. The

lowest bid was the same private company that contracted with Henry and Carroll Counties, but the rate for the city of Paris was \$28 per ton, \$7 per ton more than the rate negotiated by the two counties jointly. The reason cited for the rate difference was the volume of waste to be handled.

At about the same time that Carroll and Henry Counties were bidding for disposal, the first conflicts emerged in the region. When they began to address the collection issue, each county was informed by the state through the NTDD that they had to assure collection from 90% of all residents in the county. When they contacted state officials, they were told that if a county chose to provide collection through house-to-house pick-up, they must ensure 90% participation. All three counties agreed that the only way this could be accomplished was through mandatory collection. Local decision makers were initially distressed about forcing mandatory collection on residents, and, as one might expect, citizens were unhappy with the mandate and its associated cost. The region's response to citizen concern, however, was to say that the Act required mandatory collection and they were simply following state guidelines.

By bidding mandatory collection for all three counties together, they were able to gain significant leverage in negotiating a contract. With such a volume, through a private contract, they were able to offer door-to-door collection service to 100% of all three counties for \$3.70 per household per month. Resolutions mandating collection and approving the contract for

private collection services were drawn up and scheduled to go before each county commission, but intense citizen pressure forced local county executives to further question the state's intentions. Representatives of the state then informed the counties that they were only required to make collection service *available* to 90% of all households. Representatives from other counties unaware of the situation in the Benton-Carroll-Henry Solid Waste Region (BCHSWR) confirmed that indeed state officials originally informed them that the Act required 90% collection assurance, and then later informed them that the Act required that collection be made *available* to 90% of all households. Little imagination is required to envision the heated debate that followed. Citizens felt like county commissioners had deceived them, who in turn felt like county executives had deceived them, who in turn felt like NTDD staff had deceived them, who in turn felt like state officials had deceived them. Benton and Henry Counties then failed to pass the resolution requiring mandatory collection of MSW. Carroll County narrowly passed the resolution requiring mandatory collection, but at an enormous political cost to many local elected officials.

With Carroll County's mandatory collection, a recent study estimated that they are collecting approximately 90% of all waste generated in the county at a cost of \$3.70 per household per month. Henry and Benton Counties both have an individual contract with a private firm that allows any household in the county to pay an agreed rate and receive curbside

collection. It is estimated that the private firm contracted independently by Henry and Benton Counties currently collects from only 42% of households not serviced by city-provided collection, at a cost of more than \$10 per household per month. While the collection percentages are low, both Henry and Benton Counties have significantly increased collection percentages since the mandatory collection debate in 1993. Although the increase in the percentage of generated waste that enters the managed waste stream is a positive achievement for the two counties, it also works against achieving the 25% waste reduction goal. The goal of reducing waste disposed in a Class I landfill or incinerator by 25% is based on previous waste volumes generated. When a larger volume of waste enters the managed waste stream, it is difficult to measure actual reduction efforts.

Although it wasn't a bed of roses, the BCHSWR was able to resolve conflicts created by the collection issue and the region remained intact. But an even more difficult issue still lay ahead, through which the region could not remain unaltered. As noted previously, Benton County had purchased 500 acres for construction of a Subtitle D landfill. The site needed a state-granted permit, and two local developers approached the county commission with a plan for a large private firm to purchase the land and develop and operate a new Subtitle D landfill. In return, Benton County would receive ten years of "free" disposal, if they would allow them to apply for a permit for the landfill. The commission agreed and the firm

constructed the West Camden Landfill, which they own and operate.

Unknown to the county commission, the private firm had also negotiated a contract with Davidson County, the location of Metro Nashville, to dispose of over 2,000 tons per day of waste generated by Nashville. The private firm committed twenty-four 18-wheeler trucks to haul continuously from Davidson County to the West Camden Landfill. Additionally, the private landfill accepts waste from several other west Tennessee counties. To say that citizens were upset by this action would be a serious understatement; emotions were at an all-time high. Citizens demanded that the three-county region stop the importation of out-of-county waste. But it was not in the power of the BCHSWR to institute or monitor flow control. The region then began to examine the alternative of forming a Part 9 Authority.

The BCHSWR Board rotated their meeting sites, and at a meeting held in Camden in Benton County to discuss formation of a Part 9 Authority, over 100 citizens were in attendance and loudspeakers had to be placed in an outside parking lot to accommodate crowds that were unable to fit into the auditorium. A rather insignificant resolution was put before the board, and the six representatives from Carroll and Henry Counties voted for the resolution, while the three representatives from Benton County voted

against the resolution¹. At this point, it was revealed that a large number of audience participants were armed, and the Henry and Carroll County Executives had to be urgently escorted out of the meeting by armed guards. Residents of Benton County perceived that Henry and Carroll Counties were block voting against them, and they decided they wanted out of the region. At this point, the ten-year plan was very near completion, so the region filed a plan as the Benton-Carroll-Henry Solid Waste Management Region. However, as soon as it was possible, they split to form the Benton County Solid Waste Region and the Carroll and Henry Solid Waste Region.

The political fallout resulting from the landfill conflict was far-reaching. The Benton County Executive lost his health over the issue and was not able to seek re-election. One Benton County activist group, Protect Our Environment Today (POET), which had very strong opinions about the solid waste issue, was particularly influential in the upcoming local elections, distributing thousands of letters to citizens informing them of their version of the solid waste situation. As a result, 22 of the 25 county commissioners were not re-elected in the 1994 elections. Upon dissolution of the region, the newly-elected county commission set up a new Benton County Solid Waste Board. Twelve of the fifteen members are newly-

¹ No one interviewed could recall the exact resolution put before the region board. However, all agreed that the resolution in question was a trivial matter, and it was the principle of the perceived "block vote" that led to the resulting upheaval.

elected county commissioners. When the county voted to terminate their relationship with the other two region partners, they also voted to refuse all state grants for convenience centers, collection, recycling, education, and planning. They are currently collecting a very low percentage of generated waste, and residents that contract for private pick-up are paying more than triple the price originally negotiated by the three-county region. Some residents are required to drive as many as 60 miles to dispose of garbage at the landfill. Benton County currently has no program in place for recycling, education, or composting. They also anticipate a future violation of their contract with the operators of the West Camden Landfill over expansion of the landfill. It is likely that through a resulting law suit, the private firm will no longer be required to provide free disposal for Benton County's waste.

Carroll and Henry Counties continue to function as a two-county solid waste region, although local officials report that many political careers were ruined over this issue and the spirit of cooperation is well below the initial level. Both counties now have a very active recycling program and a full-time solid waste director. Although the counties are not formally cooperating in the areas of recycling or education, the solid waste directors for each county have a very close working relationship, and they frequently share information.

D. Lessons Learned

Factors that encouraged cooperation in the Benton-Carroll-Henry case are similar to several of those in the Inter-local and Southeast Tennessee cases. Member counties viewed cooperation as a cost-efficient solution to an expensive problem. Through cooperation, they hoped to gain an advantage in volume that would allow them to exploit economies of scale in collection and disposal. They also received encouragement from development district and CTAS staff. Additional state planning grant funds associated with multi-county cooperation were also a contributing factor. What makes this case particularly instructive is what happened after the counties agreed to cooperate as a solid waste region.

Cases previously presented, and other studies of cooperation in solid waste management, and cooperation in other areas, have led to identification of several factors that facilitate progress toward a successful cooperative effort (e.g., Cigler, 1992; Park, 1995; Gray, 1989; DeBoer, 1995). Several of these factors or conditions were either absent or weak in the Benton-Carroll-Henry case. The counties had never been involved in any past cooperative efforts. A weak attempt had been made to form a tri-county industrial board, but no progress was reported. Although the county executives had a working relationship through the West Tennessee County Executives Association, this had not provided an opportunity for building trust among the entities. Another factor that was only weakly present in

the BCHSWR was clearly defined and widely accepted potential benefits that may be gained from cooperation. All counties understood that collection and disposal of garbage in the future was going to be much more expensive than it presently was, and they all vaguely perceived that independent provision of collection and disposal services was not economically feasible. But there were never any quantitative estimates of potential cost savings available through cooperation. Instead, they all just perceived cooperation to be "cheaper" than independent provision, which they perceived to be "expensive".

All of the decision makers involved in forming the BCHSWR were stakeholders. That is, they all stood to gain or lose from the outcome they were trying to manipulate. A neutral third party broker was not involved in facilitating cooperation. In the Southeast Tennessee case, the development district fulfilled this role, and in the Inter-local case, the "cooperation entrepreneurs" (the Fayetteville and Tullahoma city managers and the MTAS legal consultant) filled this role. Another factor identified as critical for successful regional cooperation is the perception of equitable representation in decision making and an equitable distribution of costs and benefits among entities. An effort was made initially by the region to assure equal representation on the regional board. The nine-person board was composed of three representatives of each of the three counties. But Benton County later perceived that the board structure allowed the other two region

members to block vote against them. So whether representation was equal or not, the perception of inequality hindered progress toward cooperation.

Unlike the Inter-local Authority, the region did not choose to form a tight legal bond, although the region was less flexible than the Southeast Region. The resolution that was passed to form the region was the draft resolution formulated by the state. One of the primary reasons for the eventual dissolution of the region was a lack of understanding about what the region did and did not have the power to do. In the Inter-local case, potential regional partners met to discuss provisions of a resolution, until all participants were satisfied that the region would meet their needs, and then they drew up their resolution. In the Southeast Tennessee case, the development district used the state-provided draft resolution as a guideline, but then amended it to reflect agreed-upon changes demanded by potential regional partners to serve the interests of individual counties. In both cases, decision makers involved in forming the region were very clear about the contents and implications of the resolutions that created the regions. Instead of initially agreeing upon provisions of the resolution to form the region, Benton, Carroll, and Henry Counties passed a generic resolution drafted by state officials to form their resolution. By doing this, they avoided transaction costs and political risk associated with cultivating an agreeable resolution that met the needs of each individual jurisdiction, and were able to quickly form a tri-county region. But the long run cost of these

early avoided transaction costs was that each entity formed their own interpretation of what membership in the multi-county region implied. When region members were later forced to specifically define the powers of the region, it was under circumstances of extreme duress. Transaction costs were even higher, and also accompanied by extraordinary political risk. The costs of conflict resolution at this point exceeded potential benefits of multi-county cooperation.

One factor that contributed significantly to the demise of the region was a lack of public and decision maker education with respect to sensitive issues. When the Benton County Commission voted to grant a permit for construction and operation of a new landfill to a private firm, the commission's primary concern was that Benton County be guaranteed free disposal at the landfill. Although the private firm did not detail their plans for importation of out-of-county waste, they did nothing illegal, and were not asked about future plans. Naivete on the part of local decision makers was misunderstood to be intentional acceptance of imported waste when the issue began to cause conflict. When the issue escalated into conflict, the public was not educated with respect to circumstances that preceded the conflict, i.e., the county willingly granted the private firm permission to develop the landfill. They were also not educated about options available for addressing the issue of flow control. This lack of education was then

translated into perception of a loss of all autonomy, and intense political risk.

One final factor contributing toward failure of regional cooperation in this case was inconsistency at the state level. Since there was no neutral third party broker in this case, and no cooperation entrepreneur available to facilitate conflict resolution, the region depended upon the structure set in place by the state when the Act was passed. The primary liaison was the development district, which dealt primarily with county executives, who in turn worked with local decision makers. Local leaders accepted a significant level of political risk when they agreed to put forth resolutions requiring mandatory collection. When the state changed collection requirements after they had initially made them known, the only source of trust in this loose region, the state, became untrustworthy, and the political risk that local leaders had accepted was translated into political failure.

CHAPTER V

STATISTICAL MODELS

1. INTRODUCTION

Drawing upon the theoretical model previously developed and using information learned in the case studies, an attempt is now made to develop statistical models to explain the decision Tennessee counties made regarding formation of solid waste regions. After the Needs Assessments were completed, each county had approximately ten weeks to decide whether they would form a single-county solid waste region, or whether they would join neighboring counties to form a multi-county region. Although the minimum allowable size for a region was a single county, statutory language, technical advisors, and monetary incentives all encouraged formation of multi-county solid waste regions. There were no upper limits placed on region size, provided that all region members were contiguous counties. The decision each Tennessee county made regarding formation of a solid waste region provides a natural experiment in which multi-county cooperation in solid waste management may be examined through statistical models.

The objective of this section is to quantitatively examine the decision each county made regarding solid waste region formation, based on the random utility theory and the individual cases examined in previous chapters. To accomplish this objective, alternative models of the region formation decision are estimated. First, alternative specifications of a binary choice model are estimated using probit techniques, in which the dependent variable is formation of a single-county region or formation of a multi-county region. A poisson model is also estimated in which the actual number of solid waste region partners a county will join is predicted.

2. DATA AND HYPOTHESES

As noted in the theoretical model previously developed, cooperation decisions are made based on (1) characteristics of the county, and (2) characteristics of surrounding counties. But both groups, own characteristics and others' characteristics, influence the ultimate outcome in two ways; this is illustrated in Figure 16. First, examine the influence of a county's own characteristics. They directly impact the outcome by influencing how a county values characteristics of other counties. For example, if a county has a very large population, it may be less likely to cooperate because it may be able to take advantage of economies of scale in operational costs independently. But this large population also colors the way that county views characteristics of other counties. Since they already

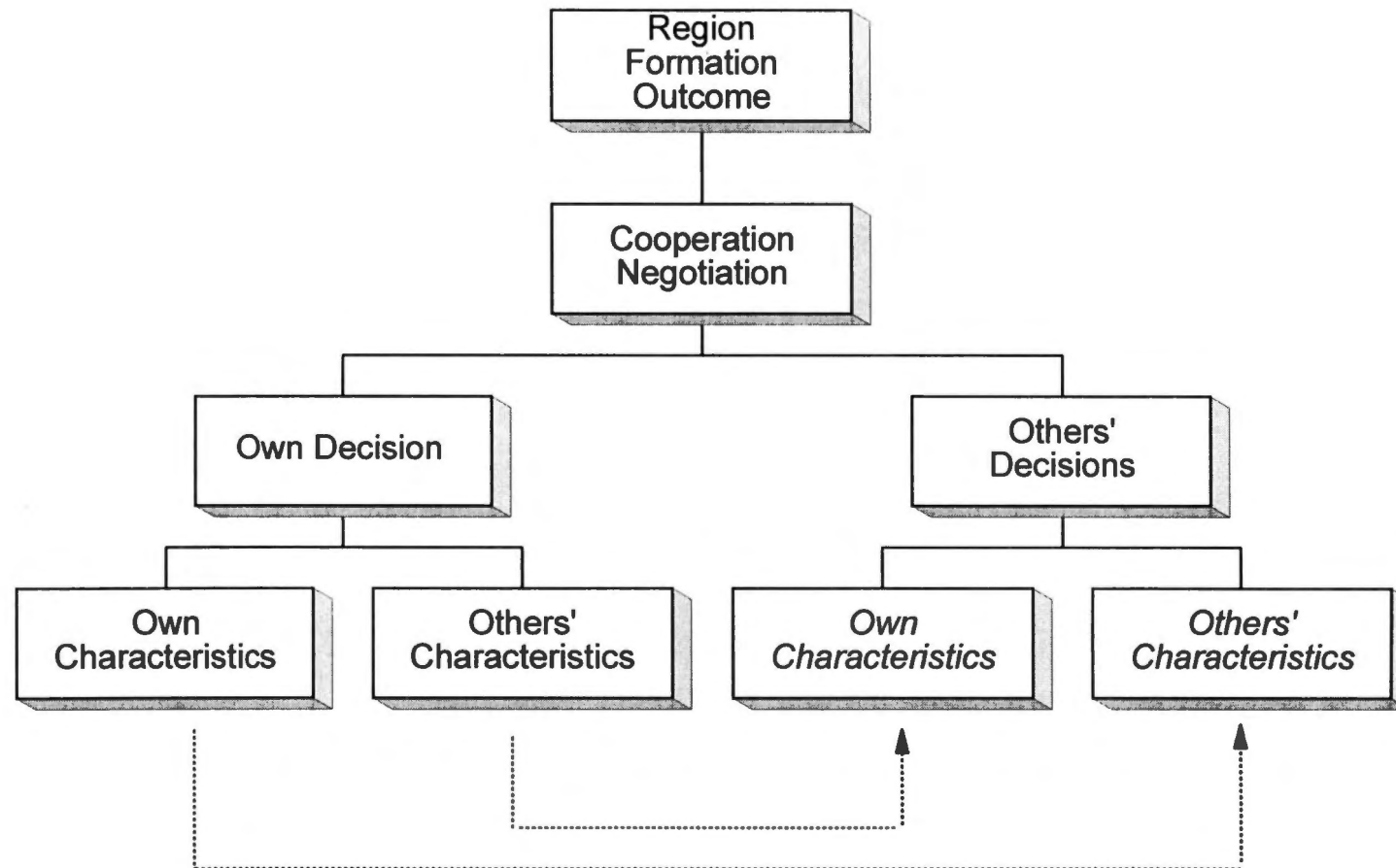


Figure 16. Influence of Characteristics on Final Outcome.

have a large population base, they may not gain the same economies of scale advantages that a small population county would by joining a neighboring county with a large population. Thus, they place a lower value on contiguous counties with a high population than a county with a low population base would. But many counties are simultaneously involved in the decision process, and the final outcome is dependent upon the interaction among individual units seeking to maximize utility. Thus, a county's own characteristics also influence the final outcome because they are a part of the set of *others' characteristics* for all other counties simultaneously involved in the decision process and cooperation negotiation.

The second group to influence the cooperation outcome is others' characteristics. As illustrated in the example of population above, others' characteristics influence a county's decision directly. But since all counties decide concurrently, characteristics of surrounding counties, then become the *own characteristics* for those other counties, influencing others' decisions, which has implications for cooperation negotiation and the final outcome.

In the theoretical model, characteristics were hypothesized to influence the utility outcome in several ways, including impacting (1) operational costs characterized by economies of scale, (2) transaction costs, (3) autonomy risk, (4) political risk, (5) a binding budget constraint, and (6) a binding solid waste service provision constraint. Drawing upon the case

studies, this section identifies variables designed to capture these impacts of own and others' characteristics.

Variable names, descriptions, means, standard deviations, minimum and maximum values may be found in Table 1. MULTI is a dummy variable equal to one if the county chose to participate in a multi-county solid waste region, and equal to zero if the county chose to be a single-county solid waste region. NUMJOIN is a discrete variable equal to the number of other counties the county chose to join in forming a solid waste region. This discrete variable takes on a value of zero if the county formed a single-county region, one if the county joined a two-county region, two if the county joined a three-county region, three if the county joined a four-county region, and four if the county joined a ten-county region. Data regarding region status were supplied by the Tennessee Department of Environment and Conservation, Division of Solid Waste Assistance. Additional data were accumulated in the District Needs Assessments compiled by development district staff in each of the nine Tennessee development districts, and from state statistical abstracts. Counties were required to make their region decisions prior to December 12, 1992, so the most recent economic and solid waste data they had available to them was from 1991. Unless otherwise noted, all data are from 1991.

Table 1. Variable Means, Standard Deviations, Minimum and Maximum Values, and Definitions.

VARIABLE	DEFINITION	MEAN	STD DEV	MIN/MAX
JOIN	1 = formed multi-county region; 0 = formed single-county region	0.47	0.50	0/1
NUMJOIN	Number of other counties joined in forming region	1.26	1.47	0/4
POP	County population (in thousands)	51.35	105.5	4.6/826
POPCC	Population of largest neighboring county (in thousands)	144.6	168.3	17/826
%URBAN	Percentage of county classified urban	28.8	24.3	0/99
%URBCC	Percentage of county classified as urban for the neighboring county with the highest percentage urban	59.5	20.8	20/99
MINPOP	Minimum number of counties required to reach a combined population of 100,000	3.1	1.7	1/9
INCDIFF	Absolute value of per capita income difference between a county and its most similar neighbor	716.44	894.35	17/4577
COMM	Number of county commissioners	17.7	5.0	9/31
COMMCC	Number of county commissioners in the neighboring county with the largest commission	22.6	3.6	11/31
SUBDLF	1 = existence of Subtitle D landfill; 0 otherwise	0.43	0.50	0/1
%CCLF	Percentage of neighboring counties with a Subtitle D landfill	45.2	24.6	0/100
%UNMAN	Potential percentage of waste stream unmanaged	30.9	24.1	0/78
CCUNMAN	Absolute value of the difference between the potential percentage of unmanaged waste in a county and its most similar neighbor	8.3	9.3	0/37
PCAPREV	Per capita total county revenue	\$726.1	133.5	322/1351
PCREVCC	Per capita revenue of the neighboring county with the lowest per capita revenue	\$604.6	102.8	322/755

A. Operational Costs

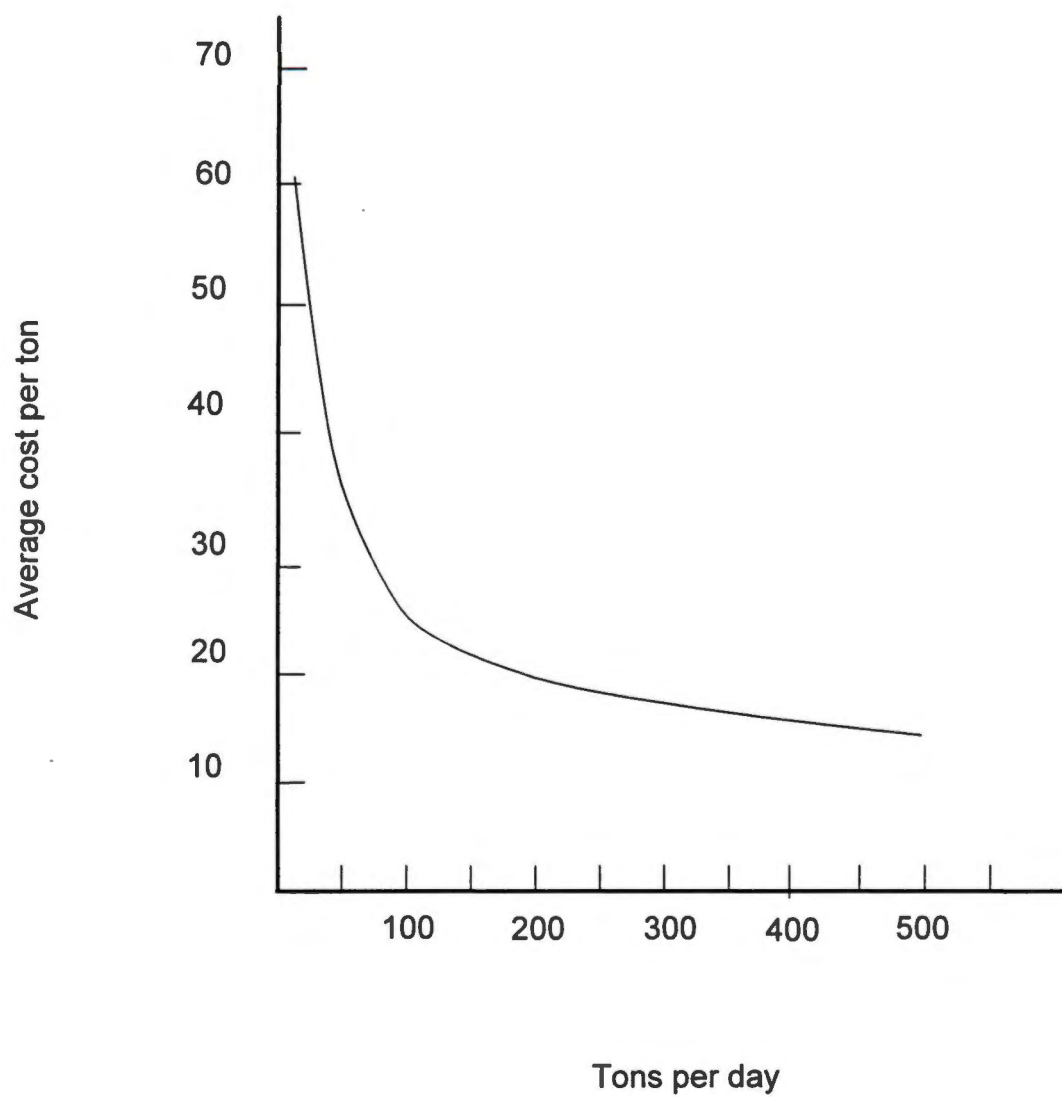
The theory predicts that counties producing small amounts of waste are more likely to cooperate because they are likely to see greater cost savings from scale economies. Potential economies of scale cost savings are primarily due to the declining average cost of landfilling in a subtitle D-compliant landfill up to an efficient tonnage level¹. While all landfilling cost estimates for subtitle D-compliant landfills predict per ton cost savings over larger volumes, there is not widespread agreement as to actual potential cost savings that may be gained from an increased volume. Economies of scale in landfill operations are based on 1) tonnage per day received at the facilities, 2) compaction rates achieved measured by in-place refuse densities, 3) percentage of landfill volume taken up by dirt required for various cover operations, and 4) average height of refuse over the liner (CTAS, 1991). The average cost savings available through larger facilities are due to the fact that more waste can be handled with relatively small

¹ The economies of scale operational cost savings argument focuses primarily on landfilling, since it is the primary method of disposal in Tennessee. According to Steuteville, in 1994, landfilling accounted for 67 percent of all disposal nationally, with recycling accounting for 23 percent and incineration accounting for 10 percent (Steuteville, 1994). At the time counties were deciding region formation, there was only one permitted operational incinerator in Tennessee, serving the Nashville area. No additional permit applications for incinerators have been filed to date, and it is expected that landfilling will remain the primary vehicle for final disposal in the near future, so this application focuses on economies of scale achievable in landfilling.

increases in equipment and labor, and there is an inverse relationship between the tonnage received per day and the percentage of dirt required for cover (CTAS, 1991).

Based on a model for Tennessee developed by the Waste Management Research and Education Institute (WMREI) in 1991, minimum average costs per ton were approached in the range of 100-200 tons per day, which serves a population range of approximately 35,000 to 70,000, assuming a generation rate of 6 pounds per person per day. The model also reveals that cost savings may be available to a greater degree for smaller populations. Estimated landfill costs per ton (assuming public financing, and including fixed capital, operating, closure, and monitoring costs) for a 25 ton per day facility serving a population under 10,000 were \$60.87 per ton. As the tonnage increased to 50 tons per day for populations in the range of 15,000 to 20,000, average costs per ton decreased to \$37.82. Costs continued to fall to \$24.17 for a 100 ton per day facility, serving approximately 35,000 people; \$19.12 for a 200 ton per day facility serving approximately 70,000, and \$14.13 for a 500 ton per day facility, serving populations over 150,000². These economies of scale are also presented graphically in Figure 17. Similar results have been shown in numerous other studies (e.g. Wenger and Rhyner, 1984; Dooley, et al., 1994; Renkow and

² This assumed a clay liner, with slightly higher costs for a composite liner.



(Source: CTAS, 1991, p. 41)

Figure 17. Economies of Scale in Average Costs of Landfill Disposal

Keeler, 1995; Georgia Department of Community Affairs, 1991), where minimum average costs were achieved with populations ranging from 50,000 to 100,000, and tonnages ranging from 100 to 250 tons per day³.

According to population figures for 1991, 67% of all Tennessee counties had a population under 35,000, and 86% of all counties had a population under 70,000. Of the 78 counties with an operational landfill in 1991, 54% of these processed fewer than 100 tons per day. Thus it appears that significant cost savings due to economies of scale were available for many Tennessee counties. The variables POP and POPCC are designed to capture potential operational cost savings due to economies of scale. POP measures a county's own population in 1991, and POPCC measures the population of the largest neighboring county. The definition of the POPCC variable necessarily assumes that the choice set under consideration is only counties that share a border with the decision making county, or its contiguous counties. In actuality, a county may join a region of contiguous counties, and not be required to share a border with each member. But while a county may consider alternatives beyond its

³ Only one known study suggests that economies of scale may be achieved with much lower volumes. A study conducted by the Georgia Environmental Policy Institute (GEPI) claims average cost results for landfills in the range of 35-100 tons per day similar to those of a minimum efficient size of 250 tons per day predicted by a model developed by the Georgia Department of Community Affairs. However, the GEPI report has been the subject of much controversy, and numerous inaccuracies, unsupported claims, and impractical assumptions have been pointed out.

contiguous counties, some limit is required for definition of a variable, and limiting consideration to a decision making county's contiguous, or neighboring, counties appears to be a logical way to define the choice set which the county considers.

If counties with large populations generate a large enough solid waste base, they may be able to take advantage of economies of scale cost savings in disposal. Counties with large populations also likely have the technical expertise and resources to operate an independent disposal facility. They may also benefit from more competition by potential service providers, which reduces costs (DeBoer, 1995). Thus one would expect counties with large populations to be less likely to join a multi-county solid waste region. However, a large population may be a desirable characteristic from the perspective of smaller surrounding counties. So while a large population makes a county less likely to choose to cooperate, it may cause other counties to desire to cooperate with it to take advantage of potential operational cost savings.

In general, a county would be more likely to form a multi-county solid waste region if at least one of its neighbors was sufficiently large to suggest potential operational cost savings. The variable POPCC attempts to capture the influence of the population of contiguous counties on a county's decision. While the county may look favorably on partnership with larger neighboring counties, one would expect these counties to be less likely to

desire cooperation since they may already be taking advantage of economies of scale in operational costs. Thus, the expected sign on the variable POPCC is negative, where existence of at least one very large neighboring county indicates that surrounding counties may be less likely to desire multi-county cooperation.

An alternative measure for potential operational cost savings would have been the tons of solid waste disposed. As expected, the tons of waste disposed and the population of a county are nearly perfectly correlated. However, a variable representing the tons of waste disposed may not capture an important aspect of potential economies of scale cost savings, which is the tons of solid waste that will have to be disposed of in the near future. Since Tennessee's comprehensive waste management legislation requires a higher level of collection services than was previously in existence, the actual tonnage of waste requiring disposal in the near future may be significantly higher than the tonnage collected in 1991. Thus, population variables may be a better indicator of potential operational cost savings attributable to economies of scale.

B. Transaction Costs

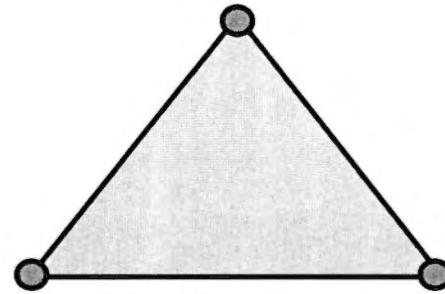
Weighing against potential economic benefits of cooperation are costs of cooperation, which tend to be nonmonetary and are more difficult to identify and quantify. One such group is transaction costs which, in the case of cooperating in forming solid waste regions, include the effort

required to develop and maintain a cooperative relationship. Individuals involved in the process of developing a cooperative relationship must devote time to make their goals and expectations known to potential region partners. They must develop working arrangements and agreements about purpose, activities, leadership, responsibility, and administration. These typically involve costs of time, opportunity, communication, and travel (Shaffer, p. 289, 1992). Theory predicts that transaction costs associated with developing and maintaining a multi-county solid waste region are negatively related to the decision to form a multi-county region. Not only are transaction costs likely to be positively related to the number of counties cooperating, but they are likely to be increasing at an increasing rate (Kahn, p. 46, 1995). We expect that marginal transaction costs would increase as a county forms a two-county planning region, but the marginal transaction costs would be greater as a two-county solid waste region expands to a three-county solid waste region. This may be shown simply by looking at Figure 18, which shows the increase in the number of lines of communication as the size of cooperative partners increases.

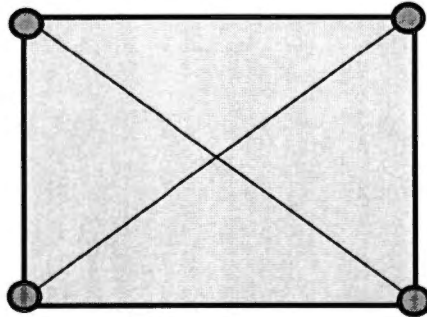
Due to the nature of transaction costs, it is difficult to identify a variable that captures their influence on the decision to form a multi-county solid waste region. It is reasonable to expect that homogeneity between potential cooperating counties may minimize transaction costs. Counties with a high degree of homogeneity likely face similar challenges in the area



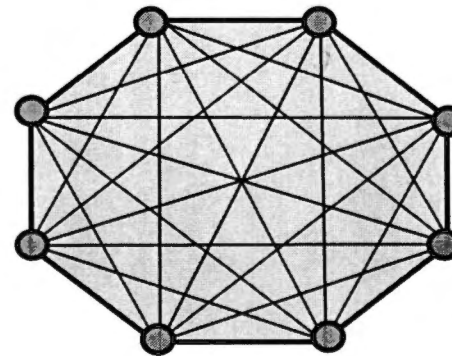
2 Counties = 1 Communication Line



3 Counties = 3 Communication Lines



4 Counties = 6 Communication Lines



8 Counties = 28 Communication Lines

Figure 18. Lines of Communication Associated With Cooperating Partners.

of solid waste management, which may make coordination of a cooperative arrangement less costly in terms of defining goals and priorities. One measure of homogeneity among counties is captured by the variable INCDIFF, which measures the absolute difference between a county's per capita assessed value and that of the most similar contiguous county. A large INCDIFF indicates that all of a county's neighbors have very different income levels (either richer or poorer), and thus they likely have different goals and priorities for solid waste management. A small INCDIFF indicates that at least one neighboring county has a similar per capita income level, so they may require minimal effort toward developing necessary relationships for communication and defining goals and expectations. The expected sign of INCDIFF is negative; the larger the difference in income levels among neighboring counties, the higher the transaction costs required to facilitate cooperation, and the less likely they are to cooperate.

It is also reasonable to expect that transaction costs may be minimized if a county has a well-developed networking and communication link with other counties, and if they have administrative personnel specializing in the management of solid waste. This may be a characteristic of more urban counties, which serve as a hub for services and communication for surrounding rural counties. The variable %URBAN measures the percentage of the county classified as urban. It may also be reasonable to expect that more urban counties have a larger administrative

staff with a higher degree of specialization and may support a staff member dedicated to management of solid waste. We expect that the more urban the county, the lower the transaction costs, implying a positive relationship between %URBAN and the decision to join a multi-county region. The degree to which neighboring counties are classified as urban may be an indicator of their ability to absorb transaction costs, as well. The variable %URBCC measures the percentage of the neighboring county classified as urban for the neighboring county with the highest percentage urban. Higher values of this variable would indicate that at least one county is highly urban and may be more likely to desire to cooperate with a county since they may be able to internalize many of the transaction costs associated with forming and maintaining a multi-county region.

As noted in the previous discussion and illustrated in Figure 18, transaction costs increase at an increasing rate as the number of partners increases. The variable MINPOP, which measures the minimum number of counties required (including your county) to reach a combined population of 100,000, is an attempt to capture this influence. Such a variable is based on the observation that significant economies of scale in operational costs are available up to a populations of approximately 100,000. While scale economies may be available for much larger populations also, marginal gains diminish beyond 100,000. Further evidence for choosing 100,000 as the threshold was shown in the case studies, where development district staff

initially suggested “rational waste sheds” for forming multi-county regions, where one of the base criteria was a combined population in the range of 100,000. One would expect a negative sign for such a variable, based on the notion that the smaller the number of cooperating partners required to exploit the bulk of economies of scale available, the lower transaction costs would be.

The variable MINPOP was calculated excluding the four largest counties from calculation. This is because the population of the fourth largest county is more than twice that of the fifth largest county. Ninety-one of Tennessee’s counties have populations under 125,000, while four have populations above 250,000. It is hypothesized that these four outliers are significantly different enough from the remaining counties that other characteristics may outweigh potential economies of scale cooperation advantages.

D. Autonomy

Counties generally desire to retain autonomy over the management of their waste stream and desire to control the importation or exportation of waste outside county borders. The variable SUBDLF is a dummy variable indicating whether or not a county has 1) a Subtitle D-compliant landfill in existence, 2) a permit application on file to upgrade an existing landfill to Subtitle D standards, or 3) a permit application on file for a new Subtitle D landfill. It is expected that if any of these three conditions are met, a

county is less likely to join a solid waste region. If a county already has a Subtitle D landfill, or firm plans for future capacity, then they may feel that through cooperating in a multi-county solid waste region, they may be forced to accept out-of county waste. Counties with landfills may feel less pressure to solve waste management problems, while counties without a landfill may be less satisfied with their current waste management situation and more inclined to join a region. Thus, existence of or plans for a landfill may give a county the sense of autonomy over the destiny of county waste, and thus make it less likely to join a solid waste region.

In addition to their own landfill situation, autonomy risk may also be indicated by the landfill situation in surrounding counties. If neighboring counties all have Subtitle D-compliant landfills already in place, then they are less likely to attempt to force importation of waste on a cooperating county with a landfill. But if neighboring counties do not have a Subtitle D landfill, then a county may perceive a loss of autonomy through cooperation, since cooperation may open the door for waste importation. The variable %CCLF is an attempt to measure the autonomy risk threat imposed by other counties by indicating the percentage of neighboring counties that have a Subtitle D landfill in place, or firm plans to construct or upgrade to a Subtitle D facility. The expected sign is positive, since a higher value would indicate that a larger percentage of neighboring counties have their disposal problem “solved”, and thus they would be less of an

autonomy risk threat to the county, making them more likely to desire multi-county cooperation.

C. Political Risk

Characteristics of MSW management make it inherently different from many other services for which regional cooperation might be advantageous, such as education, health care, or economic development (Park, 1995). Solid waste facilities are generally considered "bads" by citizens and are characterized by the NIMBY (Not-In-My-Back-Yard) syndrome. As a group, citizens generally do not identify with or take pride in solid waste facilities or services. As a result, management of solid waste is a very hot issue for many elected officials charged with compliance with the 1991 Solid Waste Management Act. Thus, there is a degree of political risk involved in decision-making with respect to regionalization. If citizens perceive regional cooperation to mean importation of out-of-county waste or to mean siting a regional disposal facility "in their backyard", whether it is true or not, then elected officials likely face political turmoil. If citizens expect cooperation to translate into higher costs in the form of user fees or increased taxes or reduced services, then the political risk to the decision maker may be significant.

There is also some political uncertainty associated with multijurisdictional planning. There is some non-zero probability that a county will invest time and money into developing a multi-county plan and

then some unforeseen event, likely political in nature, will cause the region to disband. While the probability may be low, the associated penalty would be high. Not only would the county have invested heavily and have no workable plan, costing the taxpayers money, but they may also be subject to heavy penalties for noncompliance and/or may incur significantly higher costs of beginning anew and rushing to meet deadlines.

One way to measure the degree of political risk associated with forming a multi-county solid waste region is through the variable COMM, which indicates the number of elected county commissioners in that county. It is expected that as the number of commissioners increases, political risk is shared and each individual elected official bears less of the burden of political heat. Large commissions may feel political safety in numbers. Larger commissions are also more likely to use a committee structure. When decisions are made through specialized committees, it is likely that committee members have more expertise in that particular area, and they may also be more likely to seek expert advice and outside professional opinions. Similarly, votes in a committee aren't as definitive as votes in a full commission, and it is less likely that a few politically powerful commissioners can dominate the entire commission. It is likely that issues such as solid waste receive more discussion through committees, and there are fewer small group, dark room decisions. Large commissions are also less likely to develop deep schisms among members. "Punishment" in the

form of votes is more difficult with a large commission and it is more difficult to use vote threats to play political games (Leuthold, 1996). For these reasons, it is expected that as commission size increases, political costs are reduced, thus a positive relationship exists between the number of county commissioners and joining a multi-county solid waste region.

While COMM may capture some of the political risk within a county, counties also consider the political risk associated with potential regional partners. The variable COMMCC attempts to measure this risk by indicating the number of county commissioners in the neighboring county with the largest county commission. If at least one county has a large commission, then they may also face lower political risk, which would make them (1) more desirable to the decision making county, and (2) more likely to also choose a cooperation strategy. Thus the expected sign is positive.

As was discovered in the case studies, risk (both autonomy and political) and transaction costs were reduced in some cases where (1) certain institutional structures were in place that facilitated cooperation, such as an aggressive, pro-active development district that *pushed* cooperation, (2) potential partners had successful past experience with cooperation, or (3) a cooperation entrepreneur was willing to shoulder individually much of the effort required to reduce risk and lower transaction costs. Ideally, one would like to capture the impacts of these influences in a statistical model. However, no variables were available to measure these

influences. One possible measure is a variable indicating membership in a particular development district or region, however, numerous attempts to construct such a variable all resulted in statistical problems with multicollinearity. In a regression of membership in a particular development district on characteristic variables of counties, it was discovered that individual characteristics are highly related to membership in a given development district. Thus, the impact of membership in a particular development district is captured in an array of variables indicating own county characteristics.

E. Minimum Service Level Constraint

In addition to federally mandated Subtitle D landfill requirements, each county must also comply with a host of state-mandated minimum service level requirements with respect to solid waste management in accordance with the 1991 Act. Some of these requirements include assurance of a minimum-level collection service available to at least 90% of all households, a minimum level recycling opportunity available to all households, 10-year disposal capacity assurance, and solid waste education. Some counties already exceeded these minimum requirements prior to passage of the Act, while some counties did not meet any requirements. The more effort required on the part of a county to meet state-mandated requirements, the more likely they may be to join a solid waste region. Marginal benefits of

cooperation are likely higher for counties with infant solid waste management programs than for those with well-developed programs.

The variable %UNMAN may capture the position of a county along a program development scale. %UNMAN refers to the percentage of county waste currently produced that is unmanaged. Based on per capita solid waste generation rates developed by the state, each county may determine its potential waste stream based on population, and then determine the percentage of this potential waste stream that is currently managed, based on collection and disposal records. A higher value for %UNMAN corresponds to a lower percentage of the potentially produced solid waste entering the stream of managed waste. Thus, as %UNMAN increases, a county has further to go to meet state-mandated service level requirements.

It seems reasonable to expect that counties that are at a similar stage of program development may benefit from cooperating. Thus the variable CCUNMAN measures the absolute value of the difference between the potential percentage of unmanaged waste in a county and that of its most similar neighboring county. A low value of CCUNMAN indicates that at least one of a county's neighbors faces approximately the same requirements toward meeting state guidelines for service provision. Therefore, one would expect a negative sign on the variable, where cooperation is more likely if at least one contiguous county is in a similar situation with respect to meeting state service level provision requirements.

One potential problem with the variables %UNMAN and CCUNMAN is that they are calculated based on the county population, a fixed generation rate irrespective of the type of county (e.g., rural, urban, agricultural, heavy manufacturing), and the total solid waste stream for the county, including both household and commercial solid waste. It would be possible for a county without a developed collection and disposal system for household waste to have a very low (or even negative) %UNMAN indicator if a large amount of waste is managed by the commercial sector.

F. Budget Constraint

Counties are faced with a limited amount of funds to provide all activities and services demanded by citizens, including solid waste management, and this budget constraint should be reflected in the model. It is expected that counties with higher revenue will be less hindered by new solid waste requirements, while solid waste requirements will place a larger burden on counties that are financially strained. Total county revenue is based primarily on tax revenue, thus county population and total revenue are nearly perfectly correlated. One possible measure of how fiscally binding the solid waste requirements are to the county is the per capita total revenue, indicated by the variable PCAPREV. It is expected that a high PCAPREV will negatively influence a county to join a solid waste region. Counties with high revenue per capita are more likely to be able to afford

the expenditures necessary to manage MSW according to state requirements.

As previously noted, it is not enough for a county to desire cooperation, but a cooperative solution must be agreed upon by all parties involved. The variable PCREVCC is a measure of the per capita revenue of the neighboring county with the lowest per capita revenue, and it is an attempt to measure the desire of surrounding counties to cooperate with a decision making county. For the same reasons hypothesized above, a county with a low per capita revenue stream is more likely to desire a cooperative outcome. Thus, having a neighboring county with a low per capita revenue stream is likely to make them desire cooperation also. So one would expect cooperation to be inversely related to PCREVCC. The higher the per capita revenue of the contiguous county with the *lowest* revenue value, the less likely they are to desire multi-county cooperation.

3. ESTIMATION RESULTS

A. Binary Choice Model

Results of the probit estimation may be found in Table 2. In the first specification, only variables indicating own county characteristics are included. While the theory and case studies suggest that both own characteristics and others' characteristics combine to influence the cooperation outcome, it is useful to examine the decision as a function of

Table 2. Probit Estimation Results. (Dependent variable: JOIN)

VARIABLE	Own Characteristic Spec.	Own & Others' Spec.
INTERCEPT		-0.59 (-0.30)
POP	-0.005 (-1.31)	-0.005 (-1.12)
POPCC		-0.003* (-1.86)
%URBAN	0.02** (2.18)	0.03** (2.14)
%URBCC		0.03** (2.32)
MINPOP		0.15 (1.02)
INCDIFF		0.00003 (0.14)
COMM	0.05* (1.65)	0.08** (2.06)
COMMCC		-0.07 (-1.35)
SUBDLF	-0.91** (2.82)	-0.86** (-2.38)
%CCLF		0.35 (0.44)
%UNMAN	0.02** (2.65)	0.02** (2.18)
CCUNMAN		0.007 (0.37)
PCAPREV	-0.002* (-1.70)	-0.002 (-1.39)
PCREVCC		-0.0006 (-0.32)
Log-Likelihood	-53.36	-49.35
% 0's Correct (of 50)	66% (33)	74% (37)
% 1's Correct (of 45)	64% (29)	69% (31)
Correct Predictions (of 95)	65% (62)	72% (68)

Numbers in parentheses represent the ratio of a coefficient to its asymptotic standard error.

* denotes significance at $\alpha = 0.10$.

** denotes significance at $\alpha = 0.05$.

own characteristics alone, initially. According to the theoretical model developed, counties first assess characteristics of other as a function of their own characteristics, and then the characteristics of others are assigned values based on these own characteristics. All variables in the first specification display the expected sign and all are statistically significant at least at the 10% level, except county population, POP. Counties that are more urban, have larger county commissions, and manage a lower percentage of their potentially generated waste are more likely to form a multi-county region for solid waste management. If a county has a Subtitle D landfill and currently manages a high percentage of their potentially generated waste, then they are less likely to join a multi-county solid waste region. Counties with a high level of per capita revenue are less likely to join a multi-county solid waste region. This specification predicts 66% of counties forming a single-county region correctly, and predicts formation of a multi-county region with 64% accuracy. Overall, the model predicts 65% of the responses correctly.

The other probit model specified predicts formation of a multi-county region as a function of the same own county characteristics, and also characteristics of other counties. In this specification, the only variables that are significant at a minimum level of 10% are POPCC, %URBCC, and PCREVCC, and each exhibits the expected sign. If a neighboring county has a high population, then a county is less likely to be observed as part of a

multi-county region. This emphasizes the dynamic nature of the final outcome, where a county would choose to cooperate with another county with a large population to take advantage of operational cost savings due to economies of scale. But since the other potential partners must also make that same decision for cooperation to be observed, this model indicates that existence of a neighboring county with a high population actually makes a cooperation outcome *less* likely to be observed. In other words, if a neighboring county has a very high population, then they may be able to take advantage of scale economies independently, and thus less willing to cooperate, regardless of the decision making county's desire to cooperate.

The measure of "urban-ness" of contiguous counties, %URBCC is positive and significant. This indicates that if a decision making county has at least one neighboring county that is very urban, then cooperation may be facilitated by the reduced transaction costs the urbanity of the neighboring county affords. The lower the per capita revenue of the contiguous county with the lowest per capita revenue, the higher the probability that cooperation will be observed. This may be an indicator of the willingness of a neighboring county to accept the costs of cooperation (i.e., risk, transaction costs), out of financial desperation. Overall, this model predicts 64% of the responses correctly, with 72% of single-county regions predicted accurately, and 56% of multi-county regions predicted accurately.

Table 3 reports marginal effects of changes in variables significant in the fourth model specified. Overall, the probability of forming a multi-county region was found to be 46%. By far, the variable contributing the most to the join decision is the presence of a landfill. If a county that does not have a Subtitle D landfill sites a landfill in their county, the probability of joining a multi-county region would decrease from 61% to 29%, a decrease in probability of 32%⁴. A one standard deviation increase in the population of the largest contiguous county increases the probability of forming a multi-county solid waste region by over 21%. An increase in the percentage of the county classified as urban by one standard deviation significantly increases the probability of joining a multi-county region, from 46% to 71%. A similar result is achieved by increasing the urban percentage of the contiguous county with the highest percentage classified as urban. Increasing the number of county commissioners by one standard deviation increases the probability of joining by 16%, while decreasing the potential percentage of unmanaged waste decreases the probability of joining by almost 16%. Perhaps a more meaningful consideration for the %UNMAN variable is a reduction from 31% (the state-wide average) to 10%, as

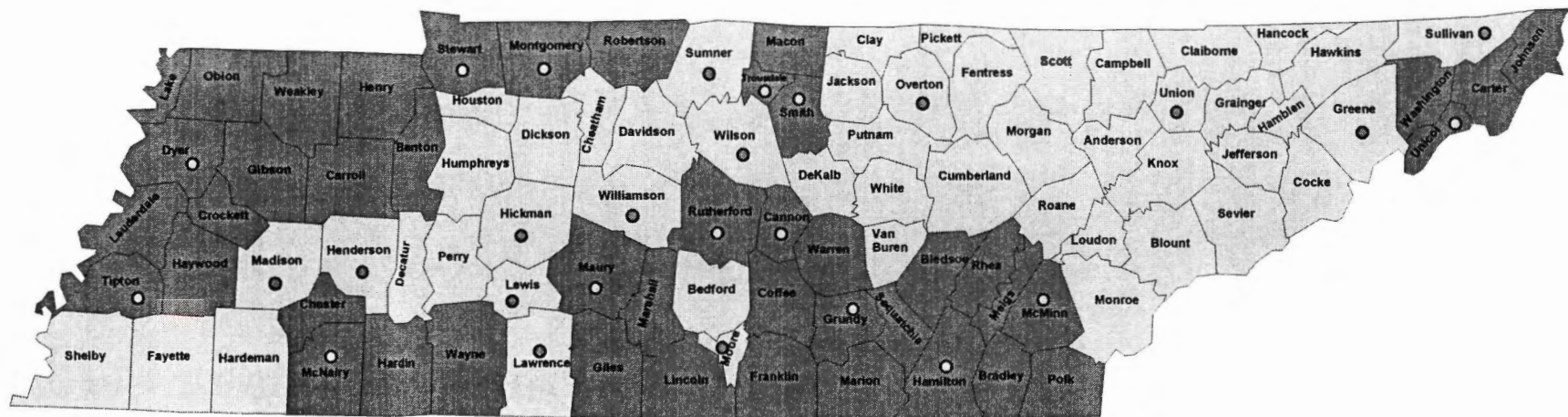
⁴ Since SUBDLF is a discrete variable only taking on 0/1 values, marginal impacts are calculated at both SUBDLF = 0 and SUBDLF = 1 levels to allow probability comparison.

**Table 3. Marginal Effects of Variables in Probit Specification #2,
Estimated at Variable Means.**

Variable	β	Mean	Std Dev	Variable Change	Change in Probability of Joining
POPCC	-0.003	144.7	168.3	Increases one standard deviation	-0.2142
%URBAN	0.026	28.81	24.26	Increases one standard deviation	0.2466
%URBCC	0.034	59.54	20.8	Increases one standard deviation	0.2827
COMM	0.079	17.73	5.00	Increases one standard deviation	0.1575
SUBDLF	-0.857	0.43	0.498	Changes from 0 to 1	-0.3270
%UNMAN	0.016	30.91	24.08	Decreases one standard deviation	-0.1567

required by the Act, which causes a reduction in the probability of joining of 13%, from 46% to 33%.

The predictive results of the second probit model specified, where the decision to form a multi-county solid waste region is a function of own and others' characteristics, are presented in Figure 19. The model attempts to capture the influences of other counties' decisions on the final cooperation outcome by including characteristics of surrounding counties as a factor in a county's decision. Figure 19, however, provides evidence that the model is not able to fully capture this dynamic aspect of the situation. For example, Union County was predicted to form a multi-county region. But all five of the contiguous counties were predicted to form single-county regions. If the model were able to fully account for decisions made by other counties, counties predicted to form multi-county regions would have to occur in clusters. The opposite situation occurs in Dyer County, where it is predicted to form a single-county region, while all contiguous counties are predicted to form multi-county regions. With full information regarding other counties, it would appear that if all contiguous counties desired cooperation, then the central county would likely face lower costs of cooperation.



165

-  County was predicted to form and actually formed a single-county solid waste region
-  County was predicted to form and actually formed a multi-county solid waste region
-  County was predicted to form a multi-county region and actually formed a single-county solid waste region
-  County was predicted to form a single-county region and actually formed a multi-county solid waste region

Figure 19. Predicted and actual solid waste regions in Tennessee

B. Poisson Model

In addition to the binary choice model, poisson and negative binomial models were specified, in which the actual number of partners a county chose in forming solid waste regions was predicted. In the poisson model, the dependent variable is NUMJOIN, which has five possible outcomes: NUMJOIN = 0 if the county joined no others in forming a solid waste region, NUMJOIN = 1 if the county joined one other county, NUMJOIN = 2 if the county joined two other counties, NUMJOIN = 3 if the county joined three other counties, and NUMJOIN = 9 if the county joined nine other counties. A fundamental assumption of a poisson model is that the mean is equal to the variance. If this assumption does not hold, then the model is overdispersed, or the variance is greater than the mean. In the case of overdispersion, a negative binomial model is more appropriate. A poisson model is a type of count data model where the dependent variable may take on one of a predetermined set of discrete values; or the data fit into one of several predetermined categories. Significance is placed on the value of the dependent variable in a poisson model; in this case, comparing a single-county region to a two-county region is not equivalent to comparing a two-county region to a three county region.

Of the 95 Tennessee counties, 50 single-county regions were formed, two counties joined to form a two-county region, 21 counties formed three-county regions, 12 counties became part of a four-county region, and one

ten-county region formed. More than half of the counties chose to join no other counties and to form a single-county region, thus it is crucial that the join/not join decision be accurately characterized in the poisson model. For this reason, the rationale for inclusion of the variables in the best binary probit specification holds similarly in this case. Of the available data, no other variables were identified that may contribute to explaining the "degree" of cooperation, so the model uses the same specification as the fourth binary choice model. Results of the poisson and negative binomial models are reported in Table 4.

The first model includes all observations, and all five region outcomes observed in Tennessee. As seen by the significance of the alpha coefficient, the poisson model is overdispersed by a factor of 0.56. That is, the variance is 0.56 times larger than the mean. So for this specification and this data, the more appropriate model is the negative binomial, which corrects for overdispersion. It is the negative binomial model that is reported in the first column of Table 4. The variable POPCC is significant and negative, as expected. As population of the largest contiguous county increases, a county is likely to join a smaller solid waste region. This interpretation is intuitive, since the larger the contiguous neighbor, the fewer counties would be required to reach some threshold population level to allow economies of scale advantages. The variables %URBAN,

Table 4. Poisson and Negative Binomial Models.
(Dependent variable NUMJOIN = 0, 1, 2, 3, 9)

VARIABLE	NEGATIVE BINOMIAL MODEL (all observations)	POISSON MODEL (dropping NUMJOIN = 9 observations)
CONSTANT	0.0005 (0.00)	-3.40* (-1.78)
POP	-0.006 (-0.15)	-0.011* (-1.62)
POPCC	-0.004** (-2.40)	-0.0008 (-0.56)
%URBAN	0.02* (1.70)	0.02 (1.48)
%URBCC	0.05** (2.98)	0.001 (0.09)
MINPOP	0.21 (1.31)	-0.03 (-0.26)
INCDIFF	-0.00008 (-0.32)	-0.0001 (-0.52)
COMM	-0.008 (-0.21)	0.10** (3.16)
COMMCC	-0.10* (-1.84)	0.07 (1.16)
SUBDLF	-0.30 (-0.83)	-0.80** (-2.53)
%CCLF	0.05 (0.05)	0.07 (0.11)
%UNMAN	0.02** (2.14)	0.006 (1.06)
CCUNMAN	0.02 (0.92)	0.01 (0.87)
PCAPREV	-0.002 (-1.05)	-0.0009 (-0.79)
PCREVCC	-0.00009 (-0.04)	-0.0006 (-0.56)
α	0.75** (2.32)	0.01 (0.06)
Log Likelihood	-148.55	-99.45
# Observations	95	85

Numbers in parentheses represent the ratio of a coefficient to its asymptotic standard error.

* denotes significance at $\alpha = 0.10$.

** denotes significance at $\alpha = 0.05$.

%URBCC, and %UNMAN are significant and positive, as expected. As each of these variables increases, a county is more likely to join a larger solid waste region. One difference, however, is that COMM is significant, but negative. Previously, binary choice models indicated that a county was more likely to join a multi-county solid waste region as commission size increases. This model indicates that as commission size increases, counties are likely to join solid waste regions with fewer participating counties.

The second model presented in Table 4 drops the largest category of responses (NUMJOIN = 9) as an alternative method of correcting for overdispersion. As evidenced by the low alpha coefficient and its lack of statistical significance, the poisson model is appropriate in this case. In this model, POP and SUBDLF are significant and negatively related to the size of the region joined. An increase in population, or the incidence of a Subtitle D landfill, makes a county more likely to join a smaller solid waste region, as expected. %URBAN and COMM are statistically significant and positively related to the size of region the county joins, as expected.

CHAPTER VI

CONCLUSIONS

1. SUMMARY OF FINDINGS

A. Theoretical Model

This research has developed a theoretical random utility model allowing examination of the process by which individual jurisdictions will cooperate with neighboring jurisdictions in the management of municipal solid waste. Conditioned upon their own characteristics, each county chooses an optimal level of solid waste services, characteristics of potential cooperating partners, and other goods and services. This optimal level of utility is then compared to that achievable with feasible region arrangements to minimize the difference between optimal and achievable alternative levels. The regional arrangement that minimizes the utility difference is then selected as the county's choice for formation of a solid waste region. This choice may be to form a single-county region, or it may be to join one or more neighboring counties to jointly form a solid waste region. All counties are making decisions regarding region preferences simultaneously. If the region strategy that minimizes a county's utility difference involves other counties, then the county enters into a process of negotiation with potential partners. This negotiation may involve tradeoffs where a county is required

to reduce transaction costs or risks faced by potential cooperating partners in order to achieve a final region outcome that leaves each participating county no worse off than their initially chosen feasible strategy.

B. Case Studies

To examine the way in which cooperation in forming solid waste regions was achieved in Tennessee, five individual regions were selected for case study. In addition to looking at the process by which regions were formed, the case studies also provide further insight into the management of solid waste under alternative regional arrangements. Of the five cases, two formed single-county regions, one formed a three-county region, one formed a ten-county region, and one formed a three-county region that later split to form a single-county region and a two-county region. This section summarizes the findings of the individual cases as they relate to the theoretical model and other contributions from the broader literature.

Operational Costs

In all cases, operational costs played a significant role in the decision process, and in the resulting management of MSW. However, the way in which individual cases assimilated cost information into the decision process varied greatly. The cases have shown that the manner in which operational cost projections are communicated to decision makers, the source from which they are communicated, and the degree of acceptance on the part of

decision makers have direct implications for the decision process. The Southeast Tennessee case provides an example of effectively communicated potential cost savings from a credible source. The development district, with the trust and respect of all member counties, presented potential cost savings to individual county commissions through short, easy to understand written summaries containing quantitative estimates, and accompanied by a seminar-type presentation. These estimates were widely accepted by individual commissions, and were cited as the primary reason why member counties chose to join the Southeast Tennessee Solid Waste Region. The time required and educational effort required to gain acceptance varied among member counties, but even in the case of one county where the cost estimates were initially disbelieved, persistent education efforts eventually led to acceptance.

On the other end of the spectrum, the Scott County case provided an example of a decision process absent wide acceptance of future operational cost estimates. While crude estimates of future costs under alternative scenarios were available to some decision makers, there was widespread denial about the degree to which Subtitle D regulations and state legislated MSW regulations would be binding. The degree of doubt was great enough that potential operational cost savings were essentially discounted when the region formation decision was being made. Since that time, information regarding true costs has been very effectively communicated through actual

fiscal strain. Now that potential operational cost savings are being considered by decision makers responsible for the handling of MSW, they are considering cooperation as a strategy to address MSW management. For decision makers to embrace cooperation as a waste management strategy, potential operational cost savings due to economies of scale in disposal have to be not only available, but also effectively communicated and widely accepted.

Transaction Costs

Several elements of the individual cases contributed toward an understanding of how transaction costs influence the decision making process and resultant solid waste management practices. A history of cooperation among potential partners, even if the outcome was less than satisfactory, aids in reducing transaction costs associated with region formation, as was evidenced by the Inter-local and Southeast Tennessee cases. Past cooperative efforts build relationships of trust and comraderie. They also reveal goals, norms, and values of potential cooperative partners, which lower transaction costs. An individual(s) serving as a cooperation entrepreneur(s) reduces transaction costs by taking charge of the tempo of the decision process and serving as a focus point for new interest, as was the case in the Inter-local Authority. Similarly, transaction costs are minimized in the presence of an institutional arrangement in place that serves as a cooperation cornerstone, as was the role of the development

district in the Southeast Tennessee Region. An institutional arrangement with the resources required to evaluate options, coordinate meetings, establish cooperation rules, and resolve conflict, while maintaining full trust and confidence of members, significantly reduces transaction costs. Homogeneity among potential participants, or perception of homogeneous problems, also reduces transaction costs, as evidenced by the Inter-local and Benton-Carroll-Henry cases. Conversely, if the institutional structure for decision making is restricted to a narrowly defined framework, as was the case in Cocke County, transaction costs are higher.

The formality of the legal bond among partners may influence transaction costs in different ways. Higher initial transaction costs may be required to develop a formal legal commitment, as did the Inter-local Authority. But in the long run, existence of a tight bond may actually reduce transaction costs associated with re-education, continuity, and conflict resolution. This temporal tradeoff is also evidenced by the loose arrangements of the Southeast Tennessee and Benton-Carroll-Henry Regions. The Southeast Tennessee Region invested heavily in transaction costs associated with defining the flexible arrangement they desired. The Benton-Carroll-Henry Region invested minimally in defining their relationship initially. The initial investment in transaction costs associated with establishing the agreement were negatively related to the transaction costs required in the long run in both cases. Thus, a temporal tradeoff of

transaction costs appears with respect to transaction costs invested is establishing formal ties. High transaction costs invested early, whether the arrangement is for a tight or loose bond, may reduce future transaction costs associated with conflict resolution, education, and continuity.

The private sector influences transaction costs associated with the decision process and management of MSW, although the role of the private sector may be to either increase or decrease transaction costs. The Cocke County Region is an example of how the private sector may reduce transaction costs associated with cooperation, where the private sector serves as a neutral third party facilitating informal cooperation between two neighboring counties. In the case of the Inter-local Authority, the private sector has actually increased transaction costs by attempting to lure individual entities in the authority into breach of contract.

Political Risk

One factor that appears to minimize political risk associated with cooperation is past experience in a successful cooperative effort, as evidenced by the Southeast Tennessee Region. Decision makers involved in the decision process had confidence and trust in the intentions and abilities of potential partners, based on past experience, so their individual political risk was reduced. While use of a formal commitment to establish regional arrangements may increase political risk in the short run, it reduces political risk in the long run. In the Inter-local Authority, decision makers accepted a

high level of risk by forming the authority and making a sizable financial commitment to the effort. But in the long run, this commitment reduced the political risk to a tolerable level even in the issue of siting a regional landfill. The converse was evidenced by the Benton-Carroll-Henry case, where little risk was accepted initially, when no formal binding commitments were made to regional agreements. But in the long run, overwhelming political risk resulted when the boundaries of the region's authority were called into question among heated debate on sensitive issues.

The cases also revealed that the perception of equal representation on solid waste boards, and equal distribution of costs and benefits among entities under a board reduces political risk. Another factor that contributed toward reducing political risk was shown to be homogeneity among potential partners, where Scott County and Cocke County perceived the political risk associated with potential loss of autonomy to be related to their perceived differences in goals and values of neighboring counties. Finally, institutional arrangements that spread political risk over a large number of individuals appear to reduce risk levels.

Loss of Autonomy

Individual entities perceive autonomy differently and value autonomy differently. For some jurisdictions, such as Cocke County or Rhea County (in the Southeast Tennessee Region), existence of and autonomy over a disposal facility may be extremely important factors in the decision process.

For others, such as Scott County, autonomy may be highly valued until financial strain begins to raise the level of political risk, and then the impact of an autonomy loss is reduced to a level that causes them to actually relinquish nearly all autonomy over a facility. The flexibility of regional arrangements may also influence the perception of autonomy. In the Southeast Tennessee case, member counties perceived that the loose agreement they negotiated ensured autonomy for *individual* interests. Conversely, in the Inter-local Authority, member counties perceived that the tightly-constructed agreement they negotiated ensured autonomy for the *authority* as a whole.

Service Level and Budget Constraints

The Benton-Carroll-Henry case provides an example of how a binding service level constraint can encourage multi-county cooperation. In this case, all three counties perceived a similar collection problem: each would have to move from their current level of collection service (green box and some private pick-up) to a mandatory household pick-up in order to meet the state's collection requirement. Since all three counties would be pursuing the same path toward compliance with the collection mandate, they recognized potential gains in negotiating a joint solution to their similar collection problems. Another example of the influence of a binding service level constraint on the willingness to cooperate is provided by Giles County, in the Inter-local Authority. Giles County was not one of the initial target

counties identified as a potential cooperating partner. But when they were eventually approached about the possibility of cooperating, the significant changes they would be required to make to their existing solid waste service program to bring it into compliance with state guidelines was a major contributing factor to their decision to join the authority.

Similarly, a binding budget constraint was also shown to influence cooperation decisions. In Scott County, cooperation was only considered (informal cooperation brokered by a private firm) when fiscal strain became significant. In this case, it appears that the value placed on political and autonomy risk is a function of the degree to which the budget constraint is binding. Scott County was adamant about maintaining autonomy and minimizing political risk, until they could no longer “afford” this luxury, and then accepted an increased level of autonomy and political risk in return for some relief of the fiscal strain.

C. Statistical Models

The theory was then applied to the decision Tennessee counties made in 1991 regarding solid waste region formation. Information learned in the case studies was useful in identifying variables representing the characteristics (both own and others’) that may contribute to the decision process. The case studies were also useful in developing hypotheses about the effect of certain characteristics on the decision. Statistical models were

developed to predict formation of a multi-county solid waste region. Probit models predicted the decision with 72% accuracy.

Operational Costs

Variables indicating the population of the county and the population of the largest contiguous county were included in an attempt to measure the influence of potential operational cost savings due to economies of scale. As expected, population appears to be negatively related to the decision to cooperate, although it is not statistically significant. From an own county perspective, existence of highly populous neighboring counties would make cooperation desirable in order to take advantage of potential scale economies. However, the statistical significance and negative sign of the variable indicating population of the largest contiguous county highlights the *process* involved in forming a cooperative region. Not only does the decision making county have to desire cooperation, but so do all other potential cooperating partners. This variable indicates that a large population in neighboring counties makes those counties less likely to form a multi-county region, and thus the decision making county is also less likely to form a multi-county region.

Transaction Costs

Transaction costs were shown to be important through the statistical significance and positive sign of variables indicating the percentage of the county classified as urban and the percentage urban of the neighboring

county with the highest percentage urban. These variables indicate that some of the institutional structures and information exchanges, and perhaps administrative expertise associated with more urban counties aid in reducing transaction costs and thus encouraging formation of a multi-county region. One would certainly expect transaction costs to be related to the number of individual entities involved in cooperation. However, a variable indicating the minimum number of counties required to achieve a minimum threshold population did not appear related to the decision, nor did a variable attempting to capture homogeneity among contiguous counties. As noted in the case studies, transaction costs may be reduced in the presence of an institutional structure or cooperation entrepreneur or cooperation cornerstone that facilitates cooperation, or with past experience in cooperating. However, no variables could be identified to specifically incorporate these factors. Since the statistical models are static in nature, they are also not able to address temporal tradeoffs of transaction costs associated with region formation and resulting solid waste management.

Political Risk and Autonomy Risk

A variable indicating the number of county commissioners was statistically significant and positive, indicating that larger commissions may be able to spread political risk, making multi-county cooperation more likely. The variable intended to capture political risk associated with potential cooperation partners, although not statistically significant, was positive as

expected. However, when a model predicting the size of the region a county would join was estimated, the variable representing the number of commissioners was negative. This suggests that while having a large commission makes a county more likely to cooperate, it may make cooperation in a large region less likely. The most significant influence on participation in a multi-county solid waste region was identified as presence of a Subtitle D landfill, or firm plans to construct or upgrade to a Subtitle D facility. As shown in the case studies, autonomy risk is often perceived as the risk of importing waste. If a county had its own disposal facility, they were much less likely to cooperate because they may perceive cooperation as a loss of control over this facility. However, if a large percentage of surrounding counties also had a landfill, a county appeared more likely to form a multi-county region, although the variable was not statistically significant.

Service Level and Budget Constraints

Although variables included in the model to capture the influence of service level and budget constraints were not statistically significant, they do have the hypothesized signs. The decision to form a multi-county solid waste region appears to be positively related to the degree to which a solid waste service level constraint is binding, based on a variable indicating the potential percentage of the waste stream currently unmanaged. The outcome also appears positively related the degree to which the binding

constraint is similar for contiguous counties. A binding budget constraint, as indicated by a low level of per capita revenue, appears to make a county more likely to cooperate, as does a binding budget constraint in at least one neighboring county.

It should be emphasized, however, that the statistical models estimated examine only the decision Tennessee counties made by a predetermined deadline with respect to cooperation in *planning*. If a county joined a multi-county solid waste region to develop a 10-year region plan, they were in no way required to cooperate in an operational sense. There are very real differences between cooperation in planning and cooperation in action. Joint planning typically precedes joint action; however, joint planning does not imply joint action. To some counties, planning and management may be synonymous. To others, they may be almost unrelated. A statistical model cannot specifically address this issue. The only thing that can be concluded about counties forming a multi-county solid waste region is that they filed a multi-county solid waste plan in accordance with state guidelines.

2. POLICY IMPLICATIONS

As noted in Chapter I, the economics of landfill disposal of MSW, waste reduction and recycling goals or mandates, and planning requirements are causing many local governments to consider cooperation in solid waste

management. In several states, as in Tennessee, recent legislation has required local governments to consider joint provision of some or all solid waste services. This research is important in identifying conditions under which cooperation is feasible, factors that contribute toward successful cooperation in solid waste management, and policies and institutional arrangements that facilitate cooperation.

First, it is important to note that cooperation is not desirable in every situation. Operational cost savings associated with disposal are generally available to most local governments through cooperation with neighboring entities. However, each individual local government responsible for provision of MSW management services has a complex utility function they seek to maximize. Included in this function are nonmonetary considerations such as political risk and autonomy levels. Also included are transaction costs associated with cooperation that are difficult to quantify. There may be situations where fiscal considerations alone would justify cooperation, but consideration of other utility influences associated with cooperation would cause cooperation to be a suboptimal outcome. Thus, policies designed to impose cooperation upon local governments based purely on fiscal considerations will not necessarily produce optimal results for the management of MSW.

There are certain characteristics of local jurisdictions that may reduce transaction costs, reduce political risk, or reduce autonomy losses

associated with multi jurisdictional cooperation in solid waste management. These include past experience cooperating in MSW management or on other issues, presence of a cooperation entrepreneur or a cooperation cornerstone, and homogeneity among potential partners. Another aspect of cooperation facilitation is having policies and institutional arrangements in place that encourage cooperation by clearly communicating benefits of cooperation and reducing transaction costs, political risk, or autonomy losses associated with cooperation. One of these policies is sufficient time for educating decision makers about alternatives and allowing exploration of alternative options. Another is a policy designed to allow flexibility in region formation. Individual jurisdictions need to be able to tailor agreements to minimize costs operating as a barrier to cooperation. Policies including monetary incentives for multijurisdictional cooperation are only effective if the particular constraint they attempt to relieve is binding. One institutional arrangement that facilitates successful cooperation is establishment of an efficient communication link between local decision makers and entities encouraging cooperation. The requirements of the policies must be clearly defined and local decision makers must be educated with respect to these policies and their implications. To the extent possible, taking the decision making process out of the political realm will also facilitate cooperation. Policies and institutions sensitive to the conditions required for successful

cooperation can lead to more efficient provision of MSW services, and can also facilitate cooperation in other issues.

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