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SOCIAL LEARNING FOR SUSTAINABILTY: A
LOCAL GOVERNMENT APPROACH

A Dissertation APPROVED FOR THE
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BY

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ABSTRACT

The manner in which man views environmental problems is undergoing a radical transformation. Awareness is increasing that past efforts at environmental protection are insufficient and that changes, often drastic, are necessary. Clearly, greater understanding of natural systems is needed. However, scientific knowledge alone is insufficient. Scientific information must be translated into viable policy options. "Sustainability" will require increased knowledge of both the natural *and* social environments. Particularly useful will be knowledge pertaining to how scientific information is utilized in the process of what has been termed "social learning". Social learning occurs when society undergoes a transformation in the way it views an environmental problem or its solution. It often results from perceived changes in the social environment or from crisis situations. The focus of social learning is on how a problem is defined, what its scope is, or the goals its solution are intended to meet. It is often evidenced by innovative policy measures, though not all policy innovations are a result of or result in social learning.

This research integrates theoretical constructs from the literature on social learning and policy innovation, together with site-specific information, in the creation of a decision-making schematic for environmental policy innovation by the city of Tulsa, Oklahoma. A qualitative inquiry was undertaken to interpret human actions taken during the development of three innovative policy measures. Case studies were developed and

examined to determine the degree to which attributes of social learning and innovation identified in the literature were evidenced. A decision-making schematic for the innovation/social learning process in the city of Tulsa was developed. A survey of policy entrepreneurs who were engaged in the innovation process was subsequently conducted to determine the cumulative nature of social learning by the city. The overall goal of this study was to obtain a better understanding of the process of municipal-level environmental policy innovation as a first step toward a sustainable society.

None of the representations of innovation found in the literature review portion of this research did an adequate job of explaining the innovation/social learning process which took place in the case studies examined. As a result of the case study analysis, an original decision-making schematic of innovation was developed. The new schematic more adequately describes the processes of innovation and social learning. It makes clear the points of intervention for both policy entrepreneurs and scientific/technical information in the policy-making system, something lacking in the alternative representations.

The inadequacy and inaccessibility of STI is a serious barrier which must be overcome for environmental policy innovation/social learning to occur. The entrepreneur plays a key role in overcoming this barrier. One important method used to overcome this barrier is to consult with experts from outside the policy-making circle. Entrepreneurs also often serve multiple roles, facilitating the flow of information and ideas between the various agencies involved in environmental decision-making.

Chapter 1

Introduction

1 Introduction

In recent years, the focus of environmental policy has begun a transformation from regulating for environmental protection toward that of "sustainable development" (Mazmanian and Kraft 1999). Environmental policy makers currently are wrestling with the question of how to adapt the strategies and approaches for dealing with environmental problems toward more sustainable ends. Doing so requires the development of innovative policy measures which enable society's institutions to better cope with competing demands for its natural and human resources. For purposes of this research, innovative policy is defined as "programs or practices which are new to the institutions implementing them and which are evidenced by a change in standard operating practices".

Over the course of the last several decades, the City of Tulsa, OK, has earned a reputation as an innovative government with respect to municipal environmental policies and programs. Three examples of innovative environmental policy are its flood hazard mitigation efforts, its municipal solid waste recycling program, and its ozone management activities.

During the Upper Mississippi River Basin floods of 1993, for example, Tulsa received national recognition for its effective flood control strategies along Mingo Creek after enduring decades of destructive flood events. These strategies represent the culmination of many years of effort on the part of policy entrepreneurs to alter citizens' core beliefs about private property rights and the role of government in reshaping the city's growth toward sustainability.

Confronted with the pending possibility of a shortage in municipal solid waste disposal capacity, a successful metropolitan recycling effort was initiated. The resulting program, The Metropolitan Environmental Trust (The M.e.t.) has received regional praise for its innovativeness. The "Ozone Alert!" program was developed as an effort to remain in compliance with federal air quality regulations. In addition to this program, the city signed an innovative agreement with the U.S. Environmental Protection Agency which allowed the city to design and undertake its own strategies for improving local air quality in lieu of applying federally-mandated options.

All three environmental policies (hereafter referred to as Mingo Creek, The M.e.t., and Ozone Alert!) were adopted outside the boundaries of the traditional policy making model. Understanding the process of environmental policy innovation, and its complementary process of social learning, remains incomplete however (Healy and Ascher 1995; Pielke 1995). For instance, several different authors have identified different variables as necessary for the innovation process and social learning to occur (Milbrath 1989; Sabatier and Jenkins-Smith 1993; Behn 1997; Borins 1998). Others have argued that the roles played by policy entrepreneurs and scientific and technical information (STI) in the innovation process have not received adequate attention (Meo and Deyle 1993; Meo et al. 1994; Mintrom 1997). Policy entrepreneurs are persons who "... seek the adoption of innovative policy into the public domain by formulating new ideas and mobilizing support for them" (Roberts and King 1989).

This research has three purposes: (1) to describe the process of innovation which took place in Tulsa; (2) to determine which of the factors identified in the literature as key to policy innovation and social learning contributed to Tulsa's experience, and; (3) clarify the roles played by policy entrepreneurs and STI. These goals will be accomplished through a qualitative inquiry of the three innovative policy measures mentioned above, as well as an examination of an on-going environmental policy dilemma (Lake Eucha).

A review was conducted of the literature on sustainability, policy making, social learning and innovation. The review was used to formulate working definitions of social learning and policy innovation. In addition, several conceptualizations of the innovation process were identified and described. The elements of these descriptions which best fit the dynamic interaction of policy entrepreneurs, scientific and technical information and social learning which occurred in Tulsa were identified and utilized in the development of a decision-making schematic.

2 Scope of Work

In order to achieve the research goals discussed above, the following major tasks were undertaken and are discussed in greater detail in the following subsections:

2.1 Retrospective Assessment

A retrospective assessment of the process of environmental policy innovation as undertaken by the city was conducted to assess the degree to which different attributes identified in the literature review were present. A case study approach was undertaken for each of three policy innovations: (1) Mingo Creek flash-flood mitigation; (2) municipal solid waste recycling and The Metropolitan Environmental Trust; and (3) ozone/air quality management. The changes in environmental policy which occurred in the city of Tulsa were documented by reviewing literature including (but not limited to) technical reports, internal memos, and newspaper articles. For each case, key events, issues, and persons that comprised the policy debate were documented. Descriptive case timelines were developed to identify policy entrepreneurs, and appear in Appendices A through C of this document. The case studies developed, therefore, are empirical retrospectives, and the contextural variables are not known with enough certainty to develop alternative scenarios of what might have happened.

The case study results follow the same format, beginning with a brief introduction to the case. This is followed by a description of the events which precipitated innovation. The key innovations are then highlighted and discussed, with particular attention focused on the aspects of social learning which were identified. The retrospectives developed are key to understanding the nature of the innovation/social learning processes which took place. The chapters end with a summary section which places the case study in the context of the relevant literature. The following subtasks were completed during the development of the case studies:

2.1.1 Newspaper Articles

Newspaper articles served a dual purpose in developing the case studies. First, they served as a written record which was used to construct the timeline of events which took place for each case. Secondly, review of the articles gives a portrait of the overall political context in which decision-making took place. Newspaper articles were obtained from two primary sources: (1) Personal collection of one of the policy entrepreneurs; and (2) a computer search of *Tulsa World* database files.

Ann Patton, a former newspaper reporter and current employee of the City of

Tulsa Public Works Department, has kept several scrapbooks of news clippings relating to many issues over the past 30 years. These scrapbooks were catalogued into a searchable Microsoft Access database containing over 16,000 entries. In the course of cataloguing the scrapbooks, they were searched for articles pertinent to each of the three cases. All articles found in such a manner were copied, and sorted according to case and date for further analysis.

The second source for newspaper articles is the CD-ROM database available for the *Tulsa World*. This searchable database dates back to 1989. A keyword search was done for each of the three cases, as well as the Lake Eucha case (to be discussed in a subsequent section). This allowed the researcher to obtain pertinent articles which may not have been available from Ms. Patton. The result of both efforts is a collection of 2905 articles distributed across the cases as follows: Mingo Creek (1264), The M.e.t. (810), Ozone Alert! (653), and Lake Eucha (178).

2.1.2 Technical Reports, Internal Memos, Meeting Minutes, etc.

A variety of other pertinent written documentation also was analyzed in the development of the case studies. This includes documents such as U.S. Army Corps of Engineers technical reports, feasibility reports, consultant reports, reports generated by the City of Tulsa, Indian Nations Council of Governments (INCOG) planning documents, minutes from meetings discussing the various policy decisions, and internal memos. In much the same way as the newspaper articles, these documents served as a written record of what actually occurred during the time periods of interest. Approximately 100 such documents were obtained for the Mingo Creek case, 75 for the solid waste case, and over 1000 for the ozone case.

2.1.3 Policy Entrepreneur Interviews

Data obtained from available written resources were supplemented with information obtained from personal interviews with policy entrepreneurs active in the policy debate. Policy entrepreneurs were chosen for the interviews because of: 1) the availability of adequate background material, and; 2) the focus of the research on clarification of the roles played by policy entrepreneurs in the innovation/social learning process. Interviews were conducted in an informal, open-ended manner and centered around two or three general questions. "The purpose of open-ended interviewing is ... to access the perspective of the person being interviewed" (Patton 1980). This method of interviewing allowed information revealed at the time of the interview to guide the rest of the questioning. Interviews were conducted in person when possible, however, time and location constraints required some interviews to be conducted over the telephone. In all, twenty-eight interviews were conducted, each lasting for approximately one hour. All interviews were recorded on audio cassettes and transcribed for later examination. Personal notes also were taken during the interview process to record the interviewer's thoughts and reactions to the respondent's comments.

2.2 Development of Decision-Making Schematic

Based on the review of the literature, the pertinent case histories, and analysis of the response to interviews, a decision-making schematic representative of social learning for environmental policy innovation was developed. The process which was undertaken can be regarded as a "qualitative inquiry emergent design" approach as the data are not designed to fit into predetermined categories. "Qualitative data consist of *detailed descriptions* of situations, events, people, interactions, and observed behaviors; *direct* *quotations* from people about their experiences, attitudes, beliefs, and thoughts; and excerpts or entire passages from documents, correspondence, records, and case histories" (Patton 1980).

The first action taken in the development of the schematic was to build its framework based upon the theoretical underpinnings found in the literature review. This was accomplished by first representing the literature in idealized fashion. These idealized versions were then compared with Tulsa's experience to identify both their strengths and limitations in describing the case studies. Examination of the representations found in the literature showed that none did an adequate job of describing the process as seen in Tulsa. In particular, they did not adequately delineate the roles played by policy entrepreneurs and STI. The individual elements of each idealized version which applied to the case studies were then reformulated into a decision-making schematic for policy innovation as experienced in Tulsa. For this step, all possible pathways between "boxes" of the schematic were considered. The framework was then "fleshed out" using case-specific information acquired in steps 2 and 3 discussed above. This fleshing out step used the case-specific information to eliminate pathways which were not observed in any of the case studies. The resulting schematic clarifies the points at which the entrepreneurs and scientific and technical information enter the decision-making process.

2.3 Policy Entrepreneur Survey

A complimentary activity to the development of the decision-making schematic was the survey questionnaire to determine the relative importance in the innovation/social learning process of several variables identified in the literature as important. Such a survey was developed and sent to entrepreneurs active in the three case studies discussed above. The survey questionnaire was designed to detail the type of information entrepreneurs utilized, their perceived difficulties in the process, the factors they judged to be important in overcoming barriers to innovation, and whether or not they believed social learning had occurred. The survey instrument consisted of closed-ended questions, with answers placed on a scale of 1 to 6, rating the importance of the variable in the particular question (Dillman 1978; Sudman and Bradburn 1982). Of the 28 surveys sent out, 24 responses were received.

2.4 Decision-Making Schematic Applicability

To determine the nature of policy-oriented social learning by the city, the problem of water quality at Lake Eucha, an environmental dilemma currently being faced by the city, was examined. Lake Eucha is one of the primary sources of drinking water for the city of Tulsa. In recent years, elevated levels of nutrients have been found in the lake, causing eutrophication which results in taste and odor problems, as well as additional operating expenses for Tulsa's water treatment facilities. The issue of how to protect the city's drinking water supply, as well as the interests of farmers and others involved is currently being addressed by the city of Tulsa. It, therefore, provided a good context within which the schematic developed as part of this research could be examined.

A somewhat shorter case study was developed documenting the emergence of the issue on the policy agenda using the same methods discussed above. A survey was then administered to the political and technical experts active in this debate. The aim of the case study was to determine the degree to which the decision-making schematic agrees with the current decision-making paradigm operating in the city of Tulsa. The survey results were compared to those of the policy entrepreneurs.

3 Contents of Dissertation

Chapter 1 provides a general introduction to the research hypothesis and major objectives of this research. The literature review is summarized in Chapter 2. Chapters 3 through 5 present the case studies of policy innovation discussed above. Chapter 6 reviews the idealized representations found in the literature and introduces the decision-making schematic for environmental policy innovation and social learning in the city of Tulsa. The results of the policy entrepreneur survey for each of these cases are reported in Chapter 7. Chapter 8 presents the Lake Eucha case study and survey results. Chapter 9 contains a brief summary of the research findings, general conclusions, and suggestions for future research. Cited references are listed at the end of each chapter.

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Chapter 2

Literature Review

1 Introduction

This study is based on diverse literature. As such, it requires a discussion of terminology at the beginning. For purposes of this research, innovative policy is defined as programs or practices which are new to the institutions implementing them and which are evidenced by a change in standard operating practices. Policy entrepreneurs are persons who "... seek the adoption of innovative policy into the public domain by formulating new ideas and mobilizing support for them" (Roberts and King 1989). Social learning is defined to be a paradigm shift which results in enduring policy changes.

The concept of "sustainable development" is currently being advocated at national and global scales as the formula for facing the current state of human actions toward the environment. However, the meaning of this phrase is unclear. Accordingly, the first body of literature reviewed is that of sustainable development. This is followed by an overview of policy making in the United States, paying particular attention to the policy process model and the role of experts in the policy process. This brief review is followed by a discussion of the definitions and theoretical models of policy learning. This discussion first presents the various definitions of policy learning which are used as a basis for formulating a working definition of social learning. This is followed by a discussion of several models of social learning which can be tested against empirical evidence. One overarching principle of the social learning literature is that many instances in which social learning occurs result in innovative policy. Accordingly, the discussion of learning is followed by a review of the pertinent literature pertaining to policy innovation. Policy innovations are defined, followed by a discussion of models of innovation. The final section reviews the literature on social learning/innovation specifically related to environmental policy.

2 Sustainable Development

In recent years, the focus of environmental policy has begun a transformation from regulating for environmental protection toward that of sustainable development (Mazmanian and Kraft 1999). Environmental policy makers currently are wrestling with the question of how to adapt the strategies and approaches for dealing with environmental problems which were developed over the last several decades toward more sustainable ends. Doing so requires the development of innovative policy measures which enable society's institutions to better cope with competing demands for its natural and human resources. In order to appreciate the role played innovative policy measures in sustainable development, an elucidation of sustainable development and its relationship to environmental policy is required.

2.1 Definitions

The term sustainable development includes not only scientific theory (i.e., what are the environmental impacts of a proposed action?, how might impacts be mitigated?), but also processes of social transformation (i.e., how will society regulate polluters?, at what level should regulations be enacted?), concepts of morality (i.e., what level of risk is considered "acceptable"?, who should bear the "costs" of pollution?), and concepts of economics (i.e., how should the costs of pollution be borne?).

There is currently no universally accepted definition of sustainable development.

The most oft-quoted definition is that of the Brundtland Commission: "Development that would meet the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987). This definition explicitly includes the idea of accountability to future generations. President Clinton also included the accountability issue when he created the President's Council on Sustainable Development (Clinton 1993).

Tonn and MacGregor (1998), in their review of the various definitions of sustainable development, group definitions into the following categories: global views, systems views, future generations, decision theoretic views, public participation, and practitioner views. Global views are those which consider sustainable development a concept focused on problems affecting the global biosphere. Systems views look at the linkages between three main components of sustainable development: "... environment, economy, and social/cultural/community health" (Tonn and MacGregor 1998). Definitions which focus on intergenerational equity, such as that proffered by the Brundtland Commission, are grouped together under the heading "future generations".

Decision theoretic views examine sustainable development from the viewpoint of what are and are not acceptable tradeoffs. This paradigm introduces the important concepts of irreversibility and the precautionary principle. Irreversibility refers to "the need to make explicit the closing of potential options by human-initiated permanent restructuring of the environment" (Tonn and MacGregor 1998). The precautionary principle is intended to make certain that uncertainty regarding the consequences of action does not prevent action from taking place when there are threats of serious or irreversible damage. The public participation definitions make explicit their focus on the political process as a mean of working toward a sustainable future. These practitioners call for measures ranging from increased public participation in the democratic process to a complete overhaul of the policy making procedures. The final group of definitions discussed by Tonn and MacGregor are the practitioner views. These researchers observed that many of the concepts used by the other groups were included in practitioners definitions of sustainable development, with the notable exception of the global viewpoints.

Sustainable development is a concept which has many different meanings depending upon the context in which the term is used. Whatever the definition, it appears to be a concept which is here to stay in its many different forms.

2.2 Sustainable Development and Environmental Policy

Modern environmental challenges share the following characteristics: they are interdisciplinary in nature; they are (mostly) anthropogenic in origin; they are rife with conflicting interests; and they are socially constructed (i.e., they result from the fact that man values certain properties of the natural environment). Their interdisciplinary nature will require cooperation both among and between the social and natural sciences. One thing upon which most participants in current debates will agree is that man's activities have caused and/or accelerated today's most pressing problems. Conflicts of interests occur in many policy matters. In environmental policy, conflict often arises between different parties which have an interest in the problem solution (i.e., governments, corporations, environmental interest groups, non-governmental organizations [NGOs]). Often, the conflict centers around policy prescriptions for a particular problem, rather than the scientific information. The fact that environmental challenges are socially constructed, that is, society must agree that an issue is a problem and seek a solution, also can be a source of conflict over which issues are to be addressed.

The focus on sustainable development has resulted in two opposing viewpoints (representing ends of a spectrum) as to how public policy should address the environmental challenges of the next century. The first viewpoint, often termed "environmental modernization", holds that environmental constraints can be accounted for via changes in production process and corresponding institutional adaptations. In the words of Lee (1993)

> "Moving towards sustainability is a two-part process: first, revising the uses of the ecosystem so that environmental values take an economically relevant place in policy and practice; and second, incorporating the well-being of the ecosystem into the way management is conceived and implemented".

At the policy level, proponents of ecological modernization view environmental challenges as opportunities for innovation. They assume that innovations (in both technology and policy) which will ensure conservation can be encouraged through the market economy (Blowers 1997). The process of dealing with complex environmental issues is one of gradual change and adaptation of the current *status quo*.

The opposing viewpoint is that of the "risk society". Proponents of this theory hold that the environmental challenges faced today are so dire that nothing short of radical social and economic changes are needed in order for survival. In contrast to the transitional nature of economic modernization theory, this outlook is transformational by nature. The proponents offer, however, no policy prescriptions as to how these radical changes are to come about. More often they simply offer criticisms of the economic modernization theories (Blowers 1997).

These theories represent the extremes along a continuum of ideologies. Each has its individual strengths and weaknesses (Blowers 1997). Noticeably lacking from each theory is a discussion about the types of political institutions necessary for sustainable development. Due to the nature of the environmental challenges to be faced in the near future, the proper institutional framework is a necessary (but not sufficient) condition for sustainable development to become a reality. The long time-frames and great deal of coordination required for the solution of modern environmental problems will require a method of decision-making which transcends current short-term, sectoral outlooks.

The concept of social learning is one which may prove useful for the resolution of the opposing pressures applied by the search for sustainability and scientific uncertainty regarding the nature and degree of environmental problems. Milbrath (1989) argues that learning *must* occur if we are to become a sustainable society. Learning about the way in which social and natural systems interact is of particular importance. "In studies of sustainable development, some of the most important things learned seem likely to include scientific facts and models, [and] 'policy theories'..." (Parson and Clark 1995). This research is an attempt to discover how such interactions promote learning through examination of local government case studies.

3 Policy Making Process

Development of a decision-making schematic for social learning regarding environmental policy requires understanding how policy is made. The model of the American policy making process which is most useful for the purposes of this review is that known as the policy process (or policy cycle) model. It originates from a policy perspective which White (1994) terms the "policy discourse" perspective. This is a perspective which "... links analysis to the broader policy process and describes how it shapes that process and in turn is shaped by it. While it links analysis to what is politically feasible, it pushes analysis to play a role in defining what is feasible." (White 1994) This perspective provides opportunities for policy change to occur and emphasizes that institutions and persons *both* influence what is promoted on the political agenda. Proponents of this perspective feel that change (i.e., organizational/social learning) is not determined by interests, ideas, or institutions alone, but by the interaction of all three (White 1994).

The literature on the policy process identifies at least six stages: (1) issue identification/ problem recognition; (2) agenda setting; (3) policy formation; (4) policy adoption; (5) policy implementation; and, (6) policy analysis and evaluation (Kingdon 1984). The first stage involves the perception by the public that a problem does exist, and the process of bringing this problem to the attention of decision-makers. This stage can involve considerable conflict (Lee 1993).

The agenda-setting stage involves a listing of those problems to which government officials (and those persons outside of government yet closely associated with government officials) are paying serious attention at any given time. The dominant paradigm in the literature is one of many different groups vying for the attention of, and actions by, policy makers. According to Kingdon's (1984) framework, this process is dynamic and it is the convergence of "policy streams" during a "policy window" that allows "policy entrepreneurs" to persuade decision makers of their ideas.

Policy streams represent the different problems, politics, participants, and choice opportunities available to decision makers. According to May (1986), "The term [policy window] embodies the notions that opportunities for particular proposals only occur given the "right" circumstances, and that combinations of circumstances are of limited duration." Policy entrepreneurs have been defined as persons who "... seek the adoption of innovative policy into the public domain by formulating new ideas and mobilizing support for them." (Roberts and King 1989)

In this dissertation, the next two stages (policy formation and adoption) are combined into a generic stage termed "decision-making". This stage involves the enumeration and selection of viable policy alternatives. The literature discusses several models of decision-making that may occur within the policy process. They are the rational choice model, the satisficing model, incrementalism, and mixed scanning. The role of experts in guiding decision making will also be presented. These models will be reviewed in subsequent sections of this review.

The final two stages of the policy process are implementation and analysis/evaluation. The implementation stage is the actual carrying out of the policy decisions. The implementation stage is when the policy administrators actually operationalize the policy. Implementation proceeds via either a forward mapping (or top-down) or backward mapping (bottom up) trajectory. Policy evaluation is used as a process feedback loop to determine the efficacy of the policy instrument in meeting both stated and implied goals.

3.1 Decision-Making Models

3.1.1 Rational Choice Model

The conventional wisdom regarding political decision-making is that it is based on rational choice. This model assumes that all decision-makers act as rational individuals in a rational world where they have access to all information (Simon 1955). When presented with a problem, the decision-makers prioritize their specific objectives and values. They then investigate all possible alternative courses of action which may help them obtain their stated goals. This investigation includes a review of all potential consequences associated with each course of action. The final step is the selection of the one course of action or policy which comes the closest to fulfilling the highest ranked objective while preserving the highest ranked values. In economic terms, the rational decision-makers are "optimizing", that is they are acting to maximize their own utility.

The model of the rational decision-maker is an idealized model which fails to account for the real world in which policy decisions are actually made. In practice, the costs (in terms of time and money) of obtaining information on all possible choices, much less all possible outcomes, are too great to bear. Even if only a few courses of action are available, unintended consequences are inevitable, given the interrelations present in any real-world system. The rational model is further complicated by the fact that, in many instances, it is unclear which goal or value is to be optimized.

In such cases, the rational decision-maker may be forced to suboptimize. Suboptimization refers to the situation in which decisions are optimal with respect to one variable, but less than optimal with respect to another variable (Miller and Starr 1967). The concept of suboptimization more accurately depicts the method by which most decisions are truly made. Suboptimization of decisions regarding public policy does not necessarily lead to "bad" policy; in many situations the public may be better off than it would have been if the problem had never been addressed.

3.1.2 Satisficing Model

Simon (1955), in an effort to overcome the limitations of the rational decision-making model, posited the administrative satisficing model. This model is based on the decision maker operating within the concept of "bounded rationality". Simon observed that human capacity for processing information is limited. As a result, decisions tend to be made based upon a (limited) set of options with which the decision-maker is most familiar. While many options may be considered, a detailed listing of the pros and cons of each is not necessarily worked out within this model. This process allows decisions to be made within the constraints created by the limited availability of resources. Instead of maximization, the decision-makers seek a solution which is "good enough" and which allows the decision maker to resume normal functioning.

There are both limitations and implications of this model when it is applied to policy decisions. According to Janis and Mann (1977), uncertainty regarding the consequences of the best choice may cause decision-makers to select an obvious second best. This second best choice may have the additional advantage of being more familiar and therefore less likely to cause disturbances in the *status quo*. The resulting policy may or may not serve the purpose which was intended.

According to Lee (1993), the model of bounded rationality has three important policy implications. The first implication is that decision-making will routinely result in inconsistencies within the decision-making body, as each individual makes decisions based upon his/her own boundaries. The second implication, which provides hope for solutions to difficult policy decisions, is that large groups are able to accomplish what single persons cannot as each person will limit his/her options differently. This is true for both the types of accomplishments as well as for the scale of what might be accomplished. The final implication is that learning within the confines of bounded rationality is both a difficult and costly maneuver. The learning process consists of a step-by-step search for solutions which may be viewed as beneficial to one portion of a system, but may not be so for the system as a whole. In the arena of environmental policy, decisions must not prove detrimental to the whole system, as its preservation is the ultimate focus.

3.1.3 Incrementalism

In his essay on "muddling through" Charles Lindblom (1959) offered an incremental model of decision-making. In this model, as with satisficing, limited comparisons are drawn. Lindblom then places these choices within the larger framework of policy making by considering the effect of many such incremental decisions. The policy outcomes which result from this model are not based on long-term goals, but are focused on alleviating short-term shortcomings. As new ideas emerge regarding what goals/values are important, new policies are adopted which address these new problems. This process has an advantage over previous models through its ability to account for different actors who may enter and leave the decision-making process over the course of time. However, its failure to take account of the broader policy environment in which decisions are made is a serious shortcoming. This type of approach has often been taken in the past regarding environmental policy. Sustainability, however, requires that the broader policy questions must also be addressed.

3.1.4 Mixed Scanning

The theory of mixed scanning (Etzioni 1967) attempts to synthesize the rigidity of rational decision-making with the approach of Lindblom. The key feature of this model is that decision makers utilize different methods for different decisions (Janis and Mann 1977). This model further assumes that any given decision may be reached in more than one manner. It is only when a combination of models are used that the observer gains a complete picture of how decisions are actually made. Theoretically, this model would allow for all interested parties to have a voice in the decision-making process, while still allowing for a systems approach to be taken. Deliberate undertaking of a mixed scanning approach to environmental policy decisions appears to hold promise for sustainable decisions. It allows for the most varied of opinions/values to be considered while efficiently exploring many different options.

3.2 The Role of Experts

McClendon and Quary (1988) point out in their discussion of the current nature of the political environment that, as resources become more limited, political actors will need to rely more and more upon persons outside of formal policy institutions. One "outside" group which has particular importance for environmental policy are experts. In this context, "experts" refers not only to persons possessing ample technical knowledge, but also those with "political" knowledge. Benveniste (1977) discusses the role of experts in the political process at great length. He sees one of their prime functions as reducing uncertainty in the face of complex decisions.

The scientific aspects of environmental problems require highly developed technical information to be delivered to policy makers in a timely and understandable fashion. Rarely is such information available in a form that is useful to the policy maker. Further, decision-making in a climate of uncertainty involves substantial risk-taking. Increased information about the technical aspects of a problem often reduces the probability of erroneous decisions. Clearly, there is a need for technical expertise in environmental policy making in order to increase (for the policy maker) the analytical tractability of the problems being addressed and reduce their inherent risks.

Technical expertise is a necessary but not sufficient condition for addressing environmental problems. Another form of expertise, here termed "political" expertise, is also required. The nature of the policy process in the United States is such that decisions are heavily influenced by powerful persons outside of the decision-making body. Informed decision-makers are better prepared to react to political crises and the pressures exerted by the powerful elite (Benveniste 1977). "Political" experts are able to avail themselves of what Benveniste (1977) has termed "the multiplier effect". This describes the phenomenon whereby independent decision-makers who share similar beliefs about future events are able to reorient their actions towards those suggested by the experts. Political expertise involves the formation of coalitions of persons with similar beliefs, who are ready to accept the information made available by the technical experts. The role played by these policy entrepreneurs is indispensable.

4 Social Learning

This section will review the various definitions of social learning found in the literature, from which the working definition of social learning was constructed. It then reviews the general models of social learning which were the basis for the idealized versions of social learning upon which the decision-making schematic was built. The focus of this research is on policy learning which occurred in the city of Tulsa, OK, as a result of several policy innovations.

4.1 Definitions

Learning can be defined as the process of incorporating new knowledge. Heclo was one of the first researchers to explore the relationship between learning and policy (1974). He used the term "social learning" to describe "a relatively enduring alteration in behavior that results from experience" (Heclo 1974). Sabatier and Jenkins-Smith (1993) utilize a similar definition for what they call "policy-oriented learning" in their advocacy coalition framework (ACF) which will be discussed below. Lee (1993) defines social learning as "the combination of adaptive management and social change". Adaptive management is an approach to policy making which views policies as experiments from which society must learn (Lee 1993). Hall (1993) also utilizes an instrumental definition of social learning, viewing it as a deliberate attempt to change policy in view of the ultimate goals of government.

May (1992) distinguishes two types of "policy learning" from what he terms "political learning". Political learning occurs when one learns about the policy processes and prospects. Policy learning results when persons within a given domain draw lessons from experience with a given policy instrument. "Instrumental" policy learning involves lessons about the viability of certain policy instruments or implementation procedures. "Social" policy learning involves reformulating social constructions of the policy itself. The focus is on the policy problem, its scope, or its goals.

Much of what is known about group learning comes from studies that focus on private sector organizations. One of the basic assumptions of this body of literature is that dissatisfaction with performance serves as a stimulus for the search for new modes of operation. One common approach toward a definition of "organizational learning" that follows this line of reasoning is that which views learning as the adaptation of an organization to changes in its environment (which produce dissatisfaction with performance) through adjustment of its goals and/or search rules (i.e., Cyert and March 1963; March and Olsen 1975). Etheredge's construct of "government learning" (1981) suggests that these concepts, developed for private firms, apply equally to public sector organizations.

Sabatier's (1988) conception of social learning stems from his familiarity with the knowledge utilization literature. Knowledge utilization theory suggests that much of the information to which policy makers are exposed can serve an "enlightenment function", that is it serves to open the policy-maker's mind to new ways of thinking about problems and solutions (Weiss 1977). (This is in opposition to an "instrumental" use whereby information is used directly to impact the decision-making). The advocacy coalition framework (ACF) proposed by Sabatier and Jenkins-Smith (1993), and discussed in the following section, describes conditions under which policy learning would and would not be expected to occur.

Bennett and Howlett (1992) examined the policy literature to see if "learning" theories are viable alternatives to conflict-oriented theories of political change. They classified the different definitions of learning using a three-tiered approach. They answered the questions of who learns, what is learned, and what effects learning has on policy for each of five competing theories of learning. The resulting paradigm breaks "policy learning" into three concepts: (1) government learning; (2) lesson-drawing; and, (3) social learning. Government learning is process-related learning by government officials which results in organizational change (i.e., the structure of the organization is changed). Lesson-drawing is learning by policy networks regarding specific policy instruments, resulting in program changes. Social learning involves the conceptualization of ideas by the policy community and results in paradigm shifts.

This research will not focus on the political learning described by May (1992), but will instead focus on social learning, which is defined, following Bennett and Howlett (1992), to be a paradigm shift which results in enduring changes in policy. The concept of social learning includes learning by actors both within and outside formal governmental organizations. The term "organizational learning" will be used to refer to policy learning which occurs within the confines of the governmental organizations themselves.

4.2 Models of Learning

One model of policy learning which has received increasing attention over the last several years is the advocacy coalition approach framework (ACF) by Sabatier and Jenkins-Smith (1993). This approach represents an attempt by the authors to overcome some of the failures they see with the traditional public policy stages framework. They assert that the stages heuristic (i.e., the traditional model of policy formation) has difficulty accounting for the role of state/local agencies as policy innovators and the *continuing* role technical information plays in each stage of the policy process.

The framework has four assumptions: (1) understanding policy learning requires a time perspective of a decade or more; (2) the most useful method of viewing policy change is through a focus on "policy subsystems" (sets of coalitions - actors who share the same belief systems); (3) these coalitions involve all levels of government; and, (4) that public policies/programs can be conceptualized as sets of values and assumptions about how to realize goals.

An overview of the ACF is shown in Figure 1 (after Sabatier and Jenkins-Smith 1993). External system parameters (both stable and dynamic) result in a series of constraints under which policy must be formed. Within the policy subsystem, opposing coalitions advance their individual policy innovations. Compromise is reached, and the resulting policy decisions produce outputs and impacts which can act to alter exogenous constraints and coalition belief systems. Policy learning involves the feedback loops in Figure 1. Central to their framework, the authors assume that a coalition's beliefs can be characterized as core (deep-seated, personal philosophies central to the coalition) and secondary beliefs (less-entrenched beliefs, yet still important to the coalition). In policy terms, policy core beliefs are the fundamental policy positions, while secondary beliefs are often the means to realize the policy positions.

The result of the ACF is a set of twelve hypotheses delineating the interactions between advocacy coalitions, social learning, and policy change. Policy learning is such a central construct to this framework that five of the twelve hypotheses deal directly with this topic. Relating learning by advocacy coalitions to the terminology used by May (1992), policy learning (social or instrumental) occurs across coalitions, while political learning occurs within coalitions. In essence, this approach lists conditions under which social learning would and would not be expected to occur. The variables which, according to the ACF, determine the probability that learning will occur are the

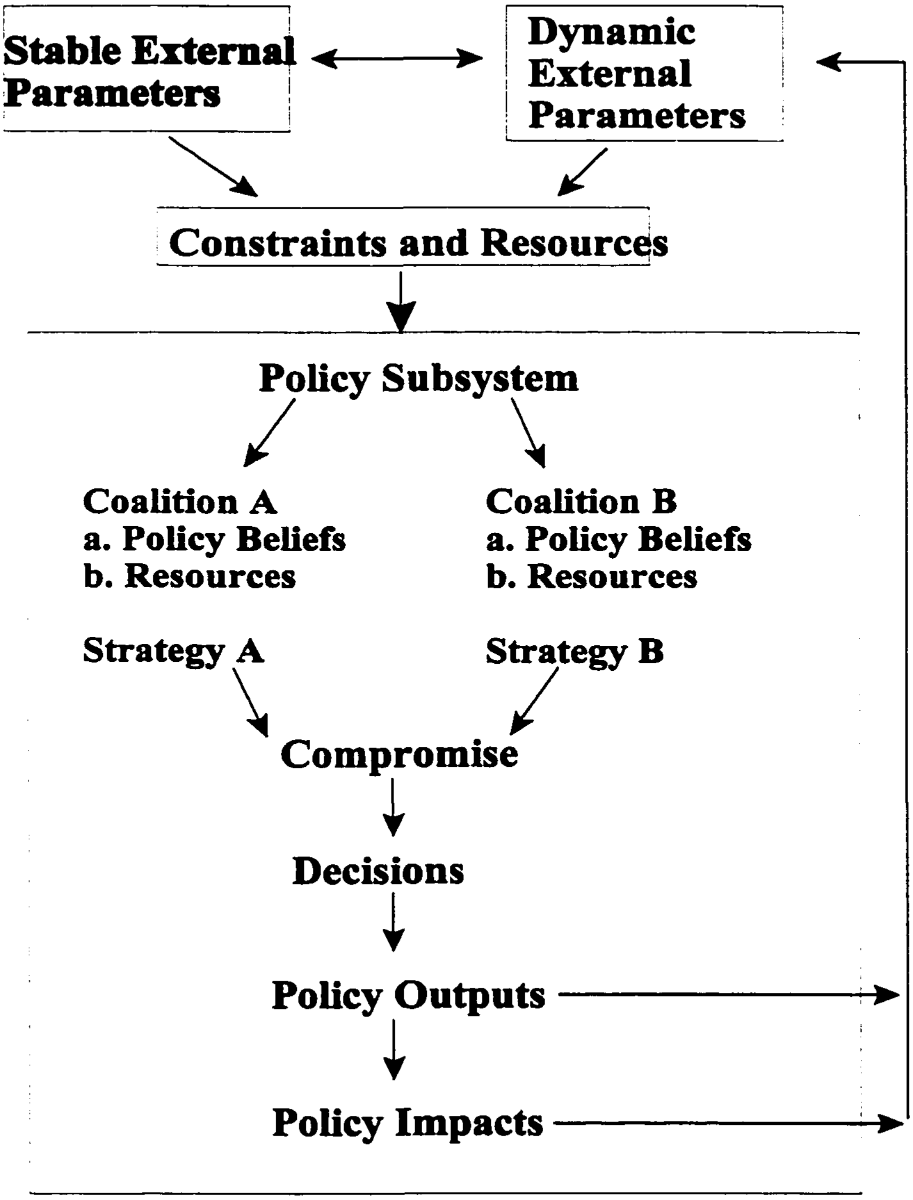

Figure 1. Overview of Advocacy Coalition Framework (after Sabatier and Jenkins-Smith 1993)

following:

(1) *level of conflict*: ***learning is most probable when an intermediate level of conflict exists***. When conflict levels are high (i.e., policy cores of all coalitions are threatened), information is most likely to be used to sustain one's own, or attack an opposing, position. As a result, little opportunity for learning exists. Conversely, when the level of conflict is too low (i.e., only secondary beliefs are threatened), little is at stake and concessions are easily given. Again, little opportunity for learning exists, as little effort is spent on trying to enlighten other coalitions.

(2) analytical tractability: ***increased analytical tractability of an issue increases the opportunity for learning to occur***. Evaluations of competing assertions are much more likely when parties can agree upon basic theories and methods. Where little overlap between coalition premises exists, there is no basis upon which to compare competing claims, and hence learning is not likely to occur.

(3) nature of the analytical forum: ***learning is most likely to occur when the policy debates take place within a professionalized forum***. This variable is postulated as important based upon several reasons. The first is that, often, professional fora are formed for increasing the analytical tractability of a problem. Secondly, the authors feel that information is often utilized in completely open fora (as opposed to a professional forum) primarily for the purpose of buttressing pre-existing policy options, which would hinder learning.

(4) existence of quantitative performance indicators: ***learning is most likely to occur when accepted quantitative performance indicators exist***. Reliable

quantitative performance indicators may increase the tractability of an issue, hence facilitating social learning. The ACF postulates that learning in this case is more likely when the performance indicators are for natural rather than for social systems.

While the ACF does a good job of explaining the process of policy learning, it is less than adequate to explain how beliefs and learning actually translate into policy. A model of policy learning which wishes to fully explain policy change must account for the translation of beliefs into actions, and place those actions in the context of the political environment in which they occur. Jenkins-Smith and St. Clair (1993) found support for many of the ACF hypotheses. However, policy change was explained not through the *actions* of the coalitions themselves, but by exogenous shocks to the system. The ACF recognizes the role which the institutional setting (here a crisis) plays in potentially altering core beliefs and the necessity for coalitions to take advantage of such situations; however, it does not focus upon the specific actions which may be taken by the coalitions in response to a crisis. According to Birkland (1997), crisis serves to focus the attention of decision makers in three ways. First, these events gain power through the use of symbolic images. Second, the social construction highlighted by a particular event will influence the policies used to deal with the crisis. Finally, political actors use these events to expand the issue to encompass concerned citizens. Many other researchers have similarly recognized the role played by crisis in social learning (May 1992; Etheredge 1981; Milbrath 1989)

A model whose theoretical underpinnings complement those of the ACF is that of institutional analysis. According to this framework, many of the efforts of individuals (or coalitions) to realize their policy preferences are directed at changing the institutional arrangements which define allowable actions (Ostrom 1990). The important difference between this construct and the ACF is that information regarding the situation in which individuals find themselves matters more than the individual's belief systems. Thus, coalitions are more than actors who share the same belief systems; they also exhibit coordinated activities aimed at providing a political environment in which their policy preferences can best be met (in Kindgon's terminology, they attempt to bring together policy streams). Nice (1994) found evidence to support this model, with his perceived importance of the "problem environment" in his study of state innovations.

Attention to the *strategies* used to translate beliefs into action is important for understanding how, why, and when coalitions may exploit "windows of opportunity" presented by their institutional environment. Both the ACF and institutional analysis frameworks fail to appreciate the importance of strategic actions beyond simply advocating one's own position (as suggested by the ACF). One strategy which is often used by differing coalitions is to utilize the same facts to construct different problem interpretations. This may be a conscious or unconscious strategy. Robinson's (1988) examination of the energy debate illustrates this point. Schön and Rein (1994) have argued that, particularly in cases involving intractable issues and high levels of conflict, reflection upon an opposing coalitions's "frame of reference" can alter the *context* in which feasible alternatives are analyzed, and may lead to social learning. In other words, putting oneself in the opposition's shoes may lead to learning.

Another important aspect of policy change/policy learning for which both the ACF and institutional analysis frameworks fail to account is the role of policy entrepreneurs (Meo and Deyle 1993). There is no discussion in these models on the policy learning effects resulting from the strategic actions of policy entrepreneurs. Strategies undertaken by *individuals* are often aimed at overcoming the many obstacles to innovation which are discussed below in the section on innovation. Given the important role these players appear to play in the policy process, their role in promoting social learning must be accounted for by any model which attempts to explain social learning. Further, these models fail to account for the nature of how scientific knowledge, a key component of environmental policy, is brought to bear in decision making (Meo et al. 1994). Westley (1995), however, cautions that scientific knowledge must be provided to decision makers in a form which they feel is useful. "Planning processes are able to incorporate stimuli from the environment, in the form of scientific information, as long as that information does not challenge the paradigms upon which the planning processes are based" (Westley 1995). She concludes that highly focused, centralized organizations seem less able to respond to new scientific/technical information.

Another model of social learning, here termed the "complex systems" model, is that which emerges from the literatures of complex adaptive systems (CASs), and innovation. Wildavsky (1988), in his study of risk, laid out the process of dealing with risk as one of balancing anticipation (of a problem) and resilience. Anticipation in this instance refers to obtaining enough technical knowledge to recognize that a problem may exist. Resilience, on the other hand, refers to having the institutional ability to cope with the potential problem. While useful for gaining insight into the nature of how society should approach uncertain events, his study offered no detail regarding the organizational structures which would maintain the learning process through time. The complex systems literature proves useful in providing insight into how organizations cope with uncertainty in a dynamic environment.

In the complex systems model, the government organizations responsible for policy decisions are viewed as analogous to complex systems. Comfort (1994) identifies four characteristics of complex systems which she sees as critical to understanding social learning. They are: (1) a capacity for innovation among organizational units which interact to achieve a common goal; (2) flexibility in the relationship between the system parts and the whole; (3) interactive exchange between the system and its environment; and, (4) a crucial role for information as the energy which drives innovation.

The capacity for innovation has been found to be a key, not only for social systems (Wildavsky 1988), but for private businesses (Seely Brown and Duquid 1996) and biological systems (Kauffman 1993) as well. As discussed below, policy innovations occur most readily when the balancing of anticipation and resilience is complemented by incorporation of incoming environmental information. System flexibility is what allows systems to be innovative and adapt to their changing environments (as well as change those environments). This flexibility is maintained by information exchange between the system and its environment; this knowledge transformation is partially responsible for "learning" at the systems level. This model views a learning system as one which is " ... capable of adapting its internal performance to new information from the external environment, and allowing its different components to adjust appropriately to one another in constructive interaction" (Comfort 1994). Information, then, is the "energy" which drives a learning system.

This view in which information is the driving force for a learning system is finding increased acceptance among ecosystem scientists. First articulated in 1988 by H. T. Odum (Odum 1988), the theory articulates concepts of self-development for open systems (including systems learning) in terms of the energy transformations which take place. In practice, energy transformation diagrams, much like ecological food chain webs, are constructed which reveal the changes in energy forms which take place (Odum 1996). According to this theory, information results from the transformation of vast amounts of lower quality forms of energy (Odum 1988).

The information driving a learning system may be technical (scientific) knowledge specifically about the problem, it may pertain to the institutional setting in which the problem is addressed, or it may be the beliefs held by individuals active in the policy process. A better understanding of the relationship between innovation (a result), information, and learning (a process undergone to achieve a result) is necessary to fully develop a decision-making schematic for social learning. Therefore, the following section reviews the literature on policy innovation.

5 Innovation

This section will review the various definitions of policy innovation found in the literature, from which the working definition of innovation was constructed. It then reviews several models of innovation which were the basis for the idealized versions upon which the decision-making schematic was built. Finally, it identifies several potential barriers to innovation.

5.1 Definitions

What constitutes an innovation in terms of public policy? Within the innovation literature there are many definitions of innovation. Basing their definition on their work with the Ford Foundation-Kennedy School of Government Innovations in State and Local Government Program, Altshuler and Zegans (1990) assume an innovation must be a new idea which has its expression in a practical course of action. The idea need not necessarily originate with the innovator; he is free to borrow and adapt it from another source. For purposes of their work, the innovator serves to link the idea to a particular problem. These authors note that innovations often consist of a mix of both familiar and novel elements.

Zegans (1997) further refined his definition of innovation with respect to the public sector in a study of nine senior public managers. He found that four common themes ran through their discussions of innovation:

> (1) Innovation is the process of implementing an idea, or enacting a technology, novel to a given situation; (2) Successful innovation depends more on implementation skills and political savvy than creative thinking; (3) Innovation is a tool for improving agency performance, not an end in itself; and, (4) Innovation is an intrinsic part of the public manager's job" (Zegans 1997).

Mintrom's (1997) definition of an innovation as "a policy that is new to the state adopting it" again stresses the novelty aspect. However, it is somewhat broader than that of Altshuler and Zegans in that it allows for policies to be "borrowed" from other locations and still be considered innovations. Following this same general definition, Nice (1994) emphasizes that to qualify as an innovation, a policy must break from existing practices. Speaking to the subtle differences between an innovation and an incremental adjustment, he states "Innovation involves the introduction of new decision rules, new technology, new approaches to organizing, or new goals." (Nice 1994). Another broad definition, which is somewhat operational, is that used by Roberts and Bradley (1991): "... the generation, translation, and implementation of new ideas into practice."

Osborne (1998) builds upon the concept of newness, using it as the first of his four core characteristics of an innovation. The second characteristic he identifies is the distinction between innovation (the application of new ideas or approaches) and invention (the discovery of new ideas or approaches). Innovation is also characterized as both a process and an outcome. The final characteristic this author finds important is the fact that innovations involve discontinuous changes. Combining these characteristics, Osborne (1998) defines policy innovation as:

> "... the introduction of new knowledge into a service system and its application, though not its discovery. This introduction produces a process of organizational transformation which itself produces discontinuity in the service production system."

This definition begins to set the stage for the relationship between innovation and social learning (referred to above as organizational transformation).

Perhaps the most general definition of innovation is that used by Polsby (1984) who defines policy innovation as policy initiation, rationalizing that all policies are innovative when first initiated. He utilized seven descriptive dimensions to classify eight case studies of innovation:

> *Timing*: The time between proposal and enactment of an innovation.
> *Specialization*: Whether "experts" or politicians serve as a source for alternatives.
> *Subculture*: Whether or not agreement exists among decision makers as to the

nature of the "problem".
Public Saliency: Degree to which innovations receive public support and attention.
Political Conflict: The degree to which innovations generate conflict.
Research: The degree to which solutions are improvised.
Staging: The degree to which problem identification and solution proposition are temporally juxtaposed.

Polsby (1984)was able to classify innovations as either Type A (acute) or Type B (incubated). Type A innovations are those characterized by a short time lapse between idea and enactment, high levels of improvisation, idea invention occurring during the search for alternatives, and little conflict. Type B innovations cluster along the opposite end of the spectrum for these four dimensions. Here again, the important connection between innovation and social learning is hinted at.

The differing definitions presented by various researchers represent more than just differences in semantics; they reflect the differences in individual researcher's backgrounds as well as their differing values. For the purposes of this work, policy innovations will be defined as "programs or practices which are new to the institutions implementing them and which are evidenced by a change in standard operating practices".

5.2 Models of Innovation

Once a definition of innovation has been agreed upon, the next questions asked are "how?" and "at what point in the policy process?" do innovations occur. The literature describes three models of innovation as they relate to policy implementation: (1) policy planning; (2) groping along; and, (3) one which will be referred to as "strategic innovation" (Berman 1980; Behn 1988; Deyle 1994; Meo and Deyle 1993).

The standard model of innovation, (often been called "policy planning") has its roots in the rational model of decision-making. Its focus is on a careful examination of all possible outcomes associated with the implementation of a given policy. The policy decisions emerge through a careful balancing of perceived outcomes and desired goals. What results are detailed prescriptions for policy implementation which are to be followed at every level of government. Such "programmed implementation" "assumes that implementation problems can be made tolerable, if not eliminated, by careful and explicit preprogramming of implementation procedures" (Berman 1980).

Rational decision-making is not the only type which fits into the policy planning model. Simon's (1955) bounded rationality/satisficing model and Lindblom's (1959) model of muddling through still emphasize the role of analysis prior to policy implementation. Hence, both would fall within the policy planning paradigm.

Behn (1988) first coined the phrase "management by groping along". This model views an agency's design of implementation strategies as akin to "adaptive implementation" (Berman 1980). In contrast to the policy planning model, little thought is given at the outset to the relationships between outcomes of specific policy decisions and explicit policy goals. In this model, policies undergo continual refinement once they are placed within the confines of their operating environment. Hence, decision-makers are given much latitude in their day-to-day decision criteria.

The recent literature offers support for the groping along model. For example, Golden (1990) examined seventeen human services innovations and suggested that the groping along model best fits the manner in which those innovations occurred. She does concede, however, that the groping along approach may not work in programs (such as many environmental policies) which must be accountable to the requirements of higher levels of government due to the conditions such accountability often imposes.

Evidence for the groping along model is also offered by Sanger and Levin (1992). These authors build upon the arguments of Behn and Golden by recognizing the importance of utilization of an existing knowledge base, perhaps through a reassemblage of such knowledge into a new conceptual framework. These authors also begin to recognize the important role crisis plays in spurring innovative activities. The observations of Sanger and Levin most closely correspond to the premises of the third model of innovation, that of strategic innovation.

In his study of innovations in American government, Borins (1998) found that planning and groping along appeared to be equally important. "Strategic" policy innovations represent a middle ground between the policy planning and groping along models. In his examination of environmental policy innovations, Deyle (1994) examines the role played by analysis in the solution of problems characterized by high levels of conflict. He concludes that the groping along model may be less than adequate in such cases. One factor which may contribute to a more planned approach in the case of environmental policy is the concern with potential legal challenges policies may face. This concern would dictate a more careful initial examination of alternatives than that suggested by the groping along model. However, the nature of scientific uncertainty with regard to environmental problems would also necessitate a more flexible approach than that of the policy planning model. It is clear that as the need for scientific knowledge increases, environmental policies must be able to adapt to changing knowledge.

Both the policy planning and groping along models focus primarily on the implementation stage of the policy process. Ingraham (1987) recognizes the inherent difficulties associated with this focus on the implementation phase of the policy cycle. "Analyses which focus on the end of the process - or at a mid-point in the cycle ... cannot account for characteristics created by the earlier activities of problem definition and policy design." (Ingraham 1987) She suggests that highly complex, uncertain problems (characteristics typical of many environmental problems) will result in many policy reformulations during the implementation and evaluation phases, even if much planning occurs during initial phases. Hence, the strategic innovation model may be most appropriate in such cases.

Deyle's (1994) view of the innovation process affirms an alternative model articulated by Roberts and King (1989) which emphasizes the role played by individuals (Roberts and King 1996) in the *entire* policy process. These authors postulate that policy entrepreneurs are involved in promoting innovation throughout *all* phases of the policy process. Aspects of both the policy planning and groping along models were found to have explanatory power in this study.

> "At the macro level of analysis Kingdon's model had much to offer. The streams of problems, solutions, choice opportunities, and the coupling function of policy entrepreneurs comprise a process that is fluid, chaotic, and governed by chance, more in line with how Kingdon's modified "garbage can model of decision making" characterizes policy making. However, at the micro level, in an analysis of their activities over time, we found the policy entrepreneurs to operate more strategically, more deliberately, with greater conscious planning and orchestration than Kingdon's model would anticipate" (Roberts and King 1989).

Deyle (1994) concludes that, for environmental policy challenges, the strategic innovation model may be most appropriate due to the scientific uncertainty regarding the nature of the problem and probable impacts of solutions. Several authors who have recently focused on the role of policy entrepreneurs at both the state and local level have found that they do indeed play an important role in the policy process (Schneider and Teske 1992; Mintrom 1997; Meo and Deyle 1993). Further, the groping along model, since it includes no initial technical or formal analysis, would not allow for incorporation of the role played by scientific and technical information which has been found to be so important (Meo et al. 1994). Investigation regarding the roles played by strategic entrepreneurs and scientific/technical information in policy innovation continues (Meo 1997).

5.3 Barriers to Innovation

Models of *how* innovation occurs will only allow for a partial glimpse into social learning regarding policy decisions. The question remains *why* do some innovations occur/succeed while others fail. Several authors have proposed barriers which must be overcome in order for policy innovations to occur. This section will review these barriers to innovation, with special consideration being given to their implications regarding social learning.

Behn (1997) presents fifteen "dilemmas of innovation" which he asserts can never be "solved" but which represent barriers to innovation which must be faced by policy makers. He groups these dilemmas into six general categories: (1) accountability dilemmas; (2) paradigm dilemmas; (3) analytical dilemmas; (4) structural dilemmas; (5) replication dilemmas; and, (6) motivation dilemmas. Accountability dilemmas address issues such as who is responsible for innovating and how should these individuals be held accountable for their innovations. Paradigm dilemmas exist due to the fact that all persons (and organizations) exist within "mental paradigms" constructed from past experiences. Innovation often requires thinking outside the boundaries of existing paradigms, a task which is very difficult indeed.

Analytical dilemmas ask the question how much analysis should occur prior to taking action to address any given problem. It is clear from the discussions above that there are differing opinions on this matter. Structural dilemmas are those faced due to the nature of the organization within which the innovation occurs. Replication dilemmas present themselves when policy makers attempt to "borrow" innovations which have already proven successful. Finally, motivation dilemmas seek to determine why some policy makers choose to innovate while others do not.

Behn identifies three accountability dilemmas: (1) authorization dilemmas; (2) failure dilemma; and , (3) customer dilemma. Theoretically, the American system of government operates so that politicians make policy and bureaucrats administer it. In reality, many civil servants are called upon to make policy decisions in the course of their everyday work. This constitutes the authorization dilemma. The failure dilemma arises as a result of the inherently risky nature of innovation. To many public managers, failure in the eyes of the public can be very costly, thus innovative policies may be approached with trepidation. Customer dilemmas address the issue of to whom are innovators accountable.

Two paradigm dilemmas which may arise are the routinization and scale dilemmas. Government operation requires rules and regulations to protect the citizens values of honesty, fairness and efficiency. However, the additional values of flexibility, ingenuity, and adaptivity may place personnel in situations which the rules cannot address. These situations may totally undermine efforts at innovation, hence the routinization dilemma. The scale dilemma acknowledges differences in the definition of innovation, while acknowledging the fact that small improvements may preclude larger innovations. It considers how significant a change must be in order to "count" as an innovation.

Based upon the varying models of innovation discussed above, it is unlikely the analytical dilemma will be resolved in the near future. The diversity dilemma is the first structural dilemma Behn identifies. Decentralized organizations provide opportunity for the generation of many innovations; however, this organizational structure acts as an impediment to the successful implementation of much of them. The diversity dilemma seeks to discover the "correct" amount of diversity needed within an organization for successful generation *and* implementation of innovations. The other structural dilemma, federalism, similarly seeks to balance innovations within the various levels and agencies of government.

On the surface, it is far easier to adapt someone else's "good" idea, than to generate it oneself. This path to innovation is, unfortunately, fraught with difficulties as well. The uniqueness of every situation requires adaptation. The adaptation dilemma occurs not only during initial replication of innovations, but throughout implementation as well. While details of innovations must be adapted to the needs of organizations, so do the organizations need adapting to the features of the innovation. This is the organizational-adaptation dilemma. The timing of replication results in the dissemination dilemma. Replication which occurs both too quickly or too slowly can harm both the original innovation and any receiving organizations. The final replication dilemma is the definitional dilemma. What exactly *is* the innovation? Is it a particular policy? Is it a change in operating procedure? These types of questions must be answered in order for others to successfully adapt innovations to their needs.

The final category of dilemmas are the motivation dilemmas: (1) media dilemmas; (2) reward dilemmas; and, (3) elected-official dilemmas. The tendency of the media to focus on failures while rarely lauding successes creates the media dilemma. Research suggests that what counts most to most innovators are intrinsic rewards such as recognition from peers. If this is true, the reward dilemma may be easy to overcome. The risks faced by elected officials seeking to innovate are much greater than those faced by civil servants. Efforts must be made by both groups to encourage innovation and share the credit for successful innovation equally. A final barrier to innovation, particularly in environmental policy, are the regulations themselves (Iles 1996). This study recognizes that in many instances, legal frameworks impose rigid enforcement mechanisms based upon static systems portrayals which can act as significant barriers for innovative policy prescriptions.

The processes of overcoming the barriers to innovation outlined by Behn can be related to the definitions of social learning discussed above. Using May's (1992) classification scheme, overcoming the accountability and structural dilemmas may lead to political learning; the replication may lead to instrumental learning; the paradigm may lead to policy learning; and, the analytical and motivation to either instrumental or policy learning. Similarly, using Bennett and Howlett's (1992) classification scheme: government learning would be evidenced by overcoming the accountability and structural dilemmas; lesson drawing would be evidenced by overcoming the replication (and to a lesser extent the analytical and motivation) dilemma; and, social learning would be evidenced by overcoming the paradigm dilemma (possibly the analytical and motivation as well). Evidence that innovators have overcome these dilemmas may serve only as *prima facie* evidence of social learning according to May (1992). In discussing the difference between learning and copying, May (1992) states the learning "implies improved understanding, as reflected by an ability to draw lessons about policy problems, objectives, or interventions." Thus, to demonstrate learning, one needs evidence of increased understanding leading to changing beliefs.

6 Social Learning and Environmental Policy

This section reviews the literature in which social learning specifically related to environmental policy was studied. One of the most thorough examinations of public policy innovation is that undertaken by Sandford Borins (1998). This broad analysis of 217 Ford-Kennedy School of Government Innovation Awards semifinalists characterizes both the innovations themselves and the people who originated them. The innovations are also grouped by policy areas, including environmental policy, for further analysis. With regard to environmental innovations, several generalities were found: (1) environmental programs are holistic and will require integration across several government departments; (2) volunteers can serve as a valuable resource and support for entrepreneurs; (3) market mechanisms and user fees may prove useful for support and enforcement of innovations; (4) substantial permeability seems to be evident across the boundary between bureaucratic and political environments; and, (5) planning and policy analysis are key aspects of successful environmental innovations.

In another study which focused on environmental policy, Weyant (1988) examined the evolution of natural gas pricing for evidence of social learning. To facilitate his analysis, Weyant used a case study approach which placed the history of natural gas pricing within the advocacy coalition framework. He concluded that modest social learning did occur across advocacy coalitions during the natural gas pricing debate. This learning was accomplished via extensive technical analysis conducted by the advocacy coalitions. This work served to further the suggestion that technical expertise is vital for social learning about environmental policy to occur. While the author found that all of the ACF's conditions for learning to occur existed, many of the debates did not necessarily occur in a professional fora, but were conducted in a professional manner.

Another study which uses the advocacy coalition framework as a method for organizing the historical events is Heintz's (1988) study of the Department of the Interior's Outer Continental Shelf oil and gas leasing program. The author describes the controversy as "a classic case of conflict between those seeking to bring about the benefits of large scale economic development (i.e. make money) and those seeking to reduce environmental degradation and local disruption." (Heintz 1988) This study found that while the debate was long and generated much technical information, little social learning occurred. In support of the ACF's hypothesis, the author contends that strong conflict and the lack of a professional forum were the reasons that little social learning took place. The policy change decisions which took place during this debate are assumed to reflect self-interest and quasi-religious values to a greater extent than the ACF can account. It serves as evidence of the strong role played by the "political" experts, in this case to such an extent that the role of technical information was undermined.

In her study of the response to the Northridge, CA, earthquake of 1994, Comfort (1994) draws three conclusions which are of importance for social learning: (1) information drives the processes of order and entropy within a complex, adaptive system, altering both the internal relationships between the parts and the whole and its external environment; (2) flexible organizational structure is essential for maintaining focus for multiple organizations working towards a common goal under conditions of uncertainty; and, (3) organizational structure needs to allow adaptation both at the system level in response to changes in the environment, and at the sub-system level to allow functioning under time and resource constraints.

Ingram (1994) studied knowledge utilization as it applied to Lake Tahoe, NV-CA, environmental policy, with particular emphasis on enlightenment via technical information as a special type of social learning. The author identifies four characteristics of the Lake Tahoe debate which are shared by many other policy subsystems and therefore may make his findings generalizable: (1) intense controversy; (2) well-matched coalitions; (3) openness; and, (4) abundant scientific information (Ingram 1994). Most environmental policy debates would certainly share many of these characteristics. His examination revealed that the conditions necessary for social learning to occur (as predicted by Sabatier and Jenkins-Smith) were not present. Therefore, while much scientific information was utilized, little social learning actually occurred.

Barke (1985) presented a historical analysis of Resource Conservation and Recovery Act (RCRA) laws, looking at stable and dynamic environmental parameters as identified by the ACF framework. He found that changes in RCRA policy could not be attributed to changes in coalition core beliefs as postulated by the ACF. Instead, he points to the power of scientific and technical information in bringing about social learning regarding hazardous waste.

In his discourse on sustainability and social learning, Lester Milbrath (1989) identifies fourteen characteristics of a "learning society":

1 Utilizes a wealth of information.
2. Finds better ways to disseminate and utilize information.
3. Emphasizes integrative and probabilistic thinking.
4. Emphasizes values as much as facts.
5. Is critical of science and technology.
6. Combines theory with practice.
7. Is consciously anticipatory.
8. Believes that change is possible.
9. Examines outcomes to learn from them.
10. Develops intuitions to foster systemic and futures thinking.
11. Institutionalizes a practice of analyzing future impacts.
12. Reorients education toward social learning.
13. Supports research.
14. Maintains openness and encourages citizen participation.

While many of Milbrath's characteristics appear reasonable at first glance, they offer little in the way of specific prescriptive advice for how society might obtain sustainability. They do, however, pinpoint two of the key aspects which other researchers have found to be critical. The first is the absolute essential nature of looking at a problem from a systems point of view. The second is the role of knowledge/information, especially scientific knowledge.

Mann (1991) argues that social learning regarding environmental problems needs a decentralized political regime in order to provide opportunities for innovations to occur. Once this occurs, he identifies four keys to learning: (1) experimentation; (2) substantial feedback; (3) redundancy; and, (4) awareness of unforeseeable consequences. Like many of the environmental issues examined thus far, his argument is focused on achieving paradigm shifts at the level of the nation-state. However, the precursor to change by nation-states is often change at the local level. This research focuses on social learning regarding environmental policy at the municipal level.

7 Conclusions

Sustainable policy will require the development of innovative policy measures. However, as shown in the literature review above, understanding of how innovative policy is made remains uncertain. Also, the nature of the relationship between social learning and innovation remains unclear. Some researchers believe that one must proceed the other. Tulsa's experience shows that social learning is continually occurring during the innovation process.

Understanding policy innovation as a process is difficult because it involves not only an understanding of the events which take place, but also of how certain people shaped those events. Policy entrepreneurs are generally acknowledged as important in the process, but uncertainty still remains as to what methods they utilize in shaping events. Additional uncertainty remains regarding the importance of STI in the innovation process, particularly regarding how entrepreneurs make use of such information. The decision-making paradigm developed as part of this research shows the manner in which Tulsa's entrepreneurs both shaped events and made use of STI in the innovation/social learning process.

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Chapter 3

Mingo Creek

1 Introduction

This chapter presents the results of the retrospective assessment for the Mingo Creek case. The timeline developed for this case is presented in Appendix A: Mingo Creek Timeline.

Several dramatic flood events as well as the proven inability of the city to react forced the city to develop the capacity to respond to flood issues. The city initially attempted to respond through floodplain management policies, and experienced only limited success. Tulsa's prevailing institutional structure did not allow these policies to work toward easing the flooding situation. The motivation of successful long-term solutions would require a dramatic event as well as an effective political coalition.

The dramatic event came in the form of the 1984 flood. The entrepreneurs involved in the actions taken in the mid-1980's constituted an effective political coalition. They successfully tapped outside expertise to find the scientific and technical information necessary to develop solutions. They also were quite adept at building partnerships with several federal agencies to overcome financial and political barriers. Finally, they worked hard to include the public in their decision-making process, gaining acceptance for their innovations, and successfully changing Tulsa's institutional environment.

2 Case Description

Initial efforts at federal flood control in the United States included the Flood Control Acts of 1928 and 1936. These early acts focused on the building of structures such as levees to prevent flooding along the nation's waterways. The 1936 act designated the U.S. Army Corps of Engineers (COE) as the primary agency for flood control works (Petak and Atkisson 1982). With the passage of the Federal Disaster Act of 1950, the federal government began offering assistance to flood victims. The Flood Control Act of 1960 (PL 86-645) authorized the COE to aid communities with floodplain maps as well as offer technical and planning assistance. This act marks the beginning of the federal government's end to exclusive reliance on structural flood controls.

The National Flood Insurance Administration (FIA) was created with the passage of the National Flood Insurance Act of 1968 (PL 90-448). This act allowed cities to obtain federally subsidized flood insurance provided they implement certain non-structural flood control measures. It also marked the beginning of the federal government's involvement with land use planning on non-public lands. Prior to the passage of this act, the U.S. Department of Housing and Urban Development (HUD) had suggested to Congress that the best use of the nation's floodplains would be to encourage a shift in land use in flood plains from residential to industrial and recreational (Petak and Atkisson 1982). The Flood Disaster Prevention Act of 1973 (PL 93-234) made participation in the National Flood Insurance Program (NFIP) requisite for receiving federal financial assistance in flood-prone properties (Petak and Atkisson 1982). It also tied floodplain management requirements to flood insurance (Greer 1999).

Historical records show that Tulsa has a long history of flooding problems (Flanagan 1994). Beginning with a series of floods in the early 1970's, Tulsa began the process of reexamining its floodplain management decisions (A. Patton 1993). Following the Mother's Day floods of May 10-11, 1970, Tulsa entered the NFIP.

Serious flooding (one with over $18 million in damage) occurred throughout the city on four separate occasions in 1974, prompting the moniker "the year of the floods" (A. Patton 1994). The 1974 floods also spurred debates in Tulsa regarding how the city should best manage its floodplains (Anonymous 6/1/1975). A citizens committee made interim recommendations regarding floodplain management in May of 1975 (A. Patton 2/15/1976). Much of the debate was prompted by the efforts of a group of concerned citizens who formed Tulsans for a Better Community (TBC) to seek flood solutions (A. Patton 12/7/1975). One member, Carol Williams, was particularly outspoken, openly challenging propositions put forth by the city engineer's office (Anonymous 2/26/1976).

The majority of TBC members lived within the Mingo Creek floodplain. Prior to 1950, this area was primarily agricultural, however, residential development in the area increased steadily through 1970 (U.S. Army Corps of Engineers 1970). Accepted practice in the early 1970's was to convey stormwater through a series of underground pipes and concrete channels. However, by the 1970's serious nationwide consideration was being given to alternative methods of control (Poertner 1974). Tulsa's debate over alternative means of stormwater conveyance coincided with a realization that the city's storm sewers were in a state of ill-repair (A. Patton 12/9/1975).

Mayor Robert LaFortune became interested in the plight of Mingo Creek residents following the 1974 floods, and requested a plan (LaFortune 1999). City engineers responded with the Mingo Creek Improvement Project, which included widening part of Mingo Creek. In order for the widening project to proceed, the city purchased and removed 33 homes along the right-of-way (A. Patton 1993). These homes were removed just prior to the Memorial Day flood of 1976.

Meanwhile, the debate over the appropriate means of dealing with stormwater continued (A. Patton 2/15/1976; Logue 2/17/1976). No interim management practices had yet been implemented, as the city commission engaged in a protracted debate of the issues (Logue 2/18/1976; A. Patton 2/18/1976). New development criteria requiring the detainment of stormwaters on-site, followed by slow downstream release, were adopted by the city commission in March of 1976 (A. Patton 3/20/1976).

2.1 Memorial Day Floods of 1976

On May 30, 1976 as much as ten inches of rain fell in parts of the city over a three hour period, the resultant flooding killed three people. The majority of the more than $34 million in damages occurred along Mingo Creek (A. Patton 1993). It was after this flood episode that members of TBC began to lobby for widespread acquisition of flood-prone properties. They lobbied for the federal government to fund a clause, Section 1362, of the flood insurance law which would provide funds to relocate frequently flooded properties. Congressman Jim Jones was particularly helpful in this regard, seeking an appropriation from Congress (A. Patton 1993; S. Williams 1999).

This flood also served as an impetus for the city to enact some policy decisions which had been part of the debate following the 1974 floods. These policy decisions included: 1) a moratorium on floodplain building; 2) hiring of the city's first full-time hydrologist; 3) the development of city-wide floodplain management policies, including stormwater detention, and; 4) the beginning of a partnership with the COE. The moratorium on floodplain building was a city-wide extension of a policy which had previously been enacted in portions of the city (A. Patton 6/12/1976). Especially hard hit would be the owners of mobile home parks which could be forced out of business. When questioned about that possibility, the street commissioner, Robert Franden, replied "That's exactly right. It's a big price to pay but that's the step necessary to prevent the terrible danger and hazard" (Earley 6/11/1976). The city had finally begun to realize that it was going to have to take actions, many of which would be unpopular, in order to protect its citizens (Anonymous 6/14/1976). The temporary moratorium, which applied to public as well as private projects, would last for 6 months. The intent was to prohibit any building until structural flood-control improvements could be made or until "land use controls that effectively deal with the problem have been adopted" (Anonymous 6/29/1976). The city commission did, however, retain the right to approve, on a case-by-case basis, some repair actions provided it could be shown they would not aggravate flood problems.

Commissioner Franden's proposal included more than the building moratorium. In addition, he also proposed a potential drainage fee, a study to determine how to include flood hazard information on property abstracts, and creation of a flood warning system (Anonymous 6/14/1976). As part of their efforts to establish new floodplain management policies, the city hired Stan Williams to act as floodplain management advisor to the city commission (Anonymous 7/11/1976). He was the person responsible for drafting floodplain management policies for the city (Anonymous 5/4/1977). In addition, the city hired its first full-time hydrologist, Charles Hardt, to focus on flooding concerns and staff the newly created hydrology department within the city engineer's office.

Shortly after the flood, members of the Urban Studies Program at The University of Tulsa who had been working with Congressman Jones convened a series of meetings to discuss the best course of action to alleviate flood problems. These meetings, and a lack of information, led to a call for a symposium to discuss the available alternatives (The University of Tulsa 1976). The symposium was timed in order to provide input into the floodplain management policy-making process. Speakers included academics, civil servants, and selected flood victims. Many of the panelists discussed floodplain management options which had been undertaken in other parts of the country, particularly Chicago, Rapid City, and Denver (The University of Tulsa 1976).

Congressman Jones served as a panelist, discussing current federal flood control efforts in Tulsa (Jones 1976). In regard to Mingo Creek, the congressman discussed two different programs on which he was working. The first program was an amendment to the benefit/cost ratio principle under which the COE determined project eligibility. The amendment to the Water Resources Act, which applied only to Mingo Creek, allowed for the improvements which the city had made to Mingo Creek since January 1975 to be included as part of the city's cost share should the COE undertake any structural flood control project along Mingo Creek (Jones 1976). As of the time of the meeting, the bill was awaiting the President's signature, which did occur. This amendment would allow for a favorable benefit/cost ratio under which the COE could seek funding the following year.

The second portion of the federal contribution to a solution for Mingo Creek which the congressman discussed was Section 1362 of the Federal Flood Insurance Act. This section allows the FIA to negotiate with homeowners on properties suffering from repeated flooding for the purchase of their homes and relocation of the homeowners (Logue 7/6/1976). The property is then turned over to the local government for its use.

This particular section had never received funding, primarily because of a conception that it would be construed as federal land use planning (Jones 1976). Congressman Jones had been working to convince the FIA director to use Mingo Creek as a demonstration project for Section 1362. While the program was not funded as of the fall of 1976, Congressman Jones stated "I feel cautiously optimistic that we can get the $6 million for a demonstration project on Mingo Creek in the supplemental appropriations early next year" (Jones 1976). His office was also working with the U.S. Department of the Interior to get funding for a park, should the relocation effort succeed.

The resulting floodplain management policy proposals, more stringent than required by the FIA, went before the city commission in May, 1977. An assistant city attorney filed a complaint against the regulations, saying the city did not have a right to impose conditions more stringent than those of the FIA (Anonymous 5/4/1977). Even at this point, after much debate, the city staff could not develop recommendations upon which all could agree and for which the city maintained the necessary data (Anonymous 5/5/1977). Despite the heated nature of the debate, a floodplain management policy was eventually adopted by the city commission in December 1977 (Anonymous 1/7/1978). The four-part policy included: the establishment of a floodway zoning district; a floodplain development permit ordinance; an earth change and stormwater drainage control ordinance; and the adoption of a criteria manual for the earth change ordinance (Strizek 1/19/78).

The establishment of floodway zoning districts was an effort to limit the types of land uses in floodways (the channel of a watercourse and adjoining portions of land required to carry a regulatory flood) to passive uses. It prohibited the location of mobile home parks within floodways. In addition, the city retained the right to prohibit reconstruction of a structure previously located in a floodway if it was more than 50 percent damaged in a flood. The floodplain development permit ordinance required that no structures be built, existing structures altered, or land modified within a floodplain without first obtaining a permit from the city engineer's office. In order to obtain a permit, certain criteria must be met including not increasing run-off to adjacent properties and elevation of the bottom floor of a structure at least 1 foot above the 100-year flood elevation.

Under the stormwater drainage control ordinance, all new development needed to be capable of accepting run-off from a 100-year flood. Control options included a combination of on-site detention and storm sewers. This was later amended to allow developers to pay a fee-in-lieu of providing on site detention. The earth change ordinance required that permits be obtained prior to initiating any excavating, grading, regrading, landfilling, berming or diking activities.

Even when these ordinances had been enacted, the debate over the city's authority regarding floodplain management continued. One citizen's lawsuit, claiming the city had no right to establish such regulations, went to the state supreme court (Rehg 5/26/1978). Controversy again raged when the stormwater detention regulations were altered in 1979 (Pearson 6/10/1984).

Following the 1976 floods, and due in large part to Congressman Jones' efforts, the city began to improve its working relationship with the COE. The Corps was working on what it called the Tulsa Urban Study. The study was a comprehensive study which looked at all aspects of water problems in Tulsa, including flood damage, quantity reduction, and water quality issues. Its objective was to develop plans which the local communities could use to "solve their water-related problems and make the best use of their water resources" (U.S. Army Corps of Engineers 1976).

As the Corps continued its study, working with city officials to determine solutions, the city continued its piecemeal flood control efforts, coordinating with the Corps along the way. The joint COE/city efforts represent all of the new flood control projects the city announced between 1978 and 1984 (see for example Rehg 10/13/1978; Anonymous 10/19/1978). The city even diverted monies which had been dedicated to channel improvements along a portion of Mingo Creek to detention facilities (Rehg 6/28/1978).

The basic effort by the city was in part due to the city commission seated during this time frame. James Inhofe, the mayor from 1978 to 1984 has been characterized by some of the entrepreneurs as anti-flood control. It was during this time period that the stormwater detention regulations were eased, allowing developers to pay a fee-in-lieu of on-site detention. The fees which were to support the construction of larger, regional detention facilities did not accumulate quickly enough to prevent serious flooding. By 1983, adequate funds had not been raised for even one of these facilities to actually be created (Neal 7/13/1983).

In the fall of 1978, the COE presented its final Mingo Creek plan to the citizens of Tulsa for approval. Their preferred plan included 23 regional detention ponds (only 1 of which would have a permanent lake) and 7.5 miles of channelization along Mingo Creek (COE 1982). The plan received the backing of both the city government (Anonymous 11/17/1978) and the homeowners coalition (Rehg 11/2/1978). As of May, 1984 the plan was still awaiting funding authorization from Congress in order for construction to begin.

2.2 Memorial Day Floods of 1984

On May 26-27, 1984, up to 14 inches of rain fell overnight (Anonymous undated newspaper article). The resulting floods killed 14 people and injured 288, resulting in over $125 million in damages along Mingo Creek. Following this devastating event, the newly elected (only 19 days in office) mayor, Terry Young, and street commissioner, J. D. Metcalfe, took action. They brought together a group of persons familiar with Tulsa's flooding problems. Among them were former city hydrologist Charles Hardt, who was working as a water engineering consultant; Stan Williams, former city planner and former FEMA employee who was working as a lawyer for the Oklahoma Corporation Commission; Ron Flanagan, Tulsa planning consultant; and Ann Patton, former reporter with the *Tulsa World* and former COE employee who was working as administrative assistant to Commissioner Metcalfe. The team's mission was to develop recovery and mitigation plans prior to the arrival of federal disaster assistance agencies on site.

> "The leadership team knew that a federal interagency hazard-mitigation team would be coming to Tulsa shortly, to issue mitigation recommendations within 15 days after the May 31 disaster declaration. Tulsa leaders determined to meet them coming in with local recommendations, couched so persuasively that the feds would agree" (A. Patton 1993).

From past experience, the task force knew that rebuilding efforts would begin almost immediately. In order to gain time to examine the possibility of acquisition and relocation, they took a series of steps to slow the process down. These included enacting moratoria on both mobile home hookups and permits for repairing damaged structures.

The temporary ban on mobile home hookups was enacted citywide, although exceptions were granted on a case-by-case basis. The ban was intended to prevent any further location of mobile homes within flood damaged areas. On June 15, the city commission approved an ordinance temporarily prohibiting major repairs of 284 homes in the areas hardest hit by flooding (Pearson 6/16/1984; Foran 6/16/1984). The ordinance was a necessary first step in relocating the families using Section 1362 monies. Both ordinances were to expire July 31, 1984, giving the city little time to formulate a relocation plan.

2.2.1 Acquisition and Relocation

The debate over relocation proved to be quite heated, with city commissioners as well as individual homeowners voicing both approval and disapproval for the proposed actions. City consultants, McLaughlin Water Engineers, proposed a solution calling for the purchase of 289 houses, many of which had suffered repeated flooding. They suggested utilizing surplus monies from a third-penny sales tax (i.e., one penny of a three-penny city sales tax) which had been approved in 1980 to fund the city's portion of the relocation costs (Neal 7/15/1984). In addition to acquisition, the consultant's report also called for various storm sewer, channelization and detention projects.

The suggestion that sales tax monies be spent for acquisition sparked a heated debate among city commissioners, with two of the five commissioners opposing the idea (Pearson 7/12/1984). In response to the opposition, Mayor Young convened a 24-member *ad hoc* panel to study the proposal and provide for public input and debate over the issue (Pearson 7/25/1984).

The bipartisan panel consisted of members of the local business community, developer representatives and individual citizens (Eveld 7/24/1984). After consideration of the issues, the committee voted to endorse the plan, calling for mandatory acquisition of 289 homes (as opposed to a voluntary program as requested by Mayor Young) (Pearson 7/25/1984). They also voted to recommend that the city permanently extend the building moratorium for those homes, thereby guaranteeing that the city would remain eligible for several federal acquisition funding programs (DelCour 7/29/1984). The committee's endorsement, as well as that of the Chamber of Commerce was then put before the city commission.

On July 31, 1984 the city commission had to make a decision on whether or not to extend the building moratorium. In order to make this decision, however, they also had to reach some consensus on how to fund the proposed acquisitions and whether or not to accept the rest of the consultant's recommendations (Pearson 7/29/1984). With opposition to using sales tax revenues still strong from two of the commissioners, a compromise was finally reached. In the compromise, the commissioners voted not to use sales tax surpluses to buy houses unless they were needed as right of way for structural improvements such as channelization or detention work (Foran and Eveld 8/1/1984). In return, one of the commissioners opposed to the plan voted for an emergency clause which extended the building moratorium. Instead of using sales tax monies, the commissioners voted for a financing measure in which short-term loans would be obtained, the monies reinvested at higher interest rates, and the excess interest would be used to fund the city's portion of the buy-out program (Pearson and DelCour 8/1/1984).

Federal funding was also available to put toward the buy-out program. Tulsa's congressional delegation was successful in having $1 million of the fiscal year 1985 flood relief budget targeted toward acquisition in Tulsa (Marler 8/8/1984). In addition, 82 of the homes targeted in the buy-out were initially deemed eligible for Section 1362 funds (Marler 8/8/1984). In the final agreement between the city and FEMA, insurance funds were first applied toward the purchase price. The remaining purchase cost was divided evenly between the city and FEMA.

The legality of the city's plan to finance buy-outs with interest monies was called into question (Foran 9/7/1984), and thirteen families filed suit, seeking to block their acquisition (Clay 8/11/1984). However, by December 1984 the buy-out was over 90% complete (Anonymous 12/22/1984). As of then, only 23 of the 191 parcels the city was obligated to buy had not yet received offers due to title problems, the citizen's lawsuit, or refusal to negotiate (Anonymous 12/22/1984). Ultimately, the program would include the purchase of 300 homes and a 228-pad mobile home park, $10.5 million in flood-control works, and $2.1 million for master drainage plans (A. Patton 1994). The buy-out efforts were only a portion of the total flood-control package eventually undertaken in Tulsa, with the COE making significant contributions as well.

2.2.2 The Corps of Engineers Mingo Creek Project

The flood of 1984 also spurred renewed interest in getting the COE's Mingo Creek project funded. No new federal water projects had been funded since the beginning of the Carter administration, however, so obtaining funding would be difficult (Averill 7/7/1985). The lack of funding partially resulted from a dispute over issues of cost-sharing (Martindale 3/27/1986). Following the 1984 flood, Congressman Jones renewed his efforts to get a water projects authorization bill which included monies for the Mingo Creek project authorized. However, congressional leaders abandoned the bill in the fall of 1984 (Howell 10/11/1984). Oklahoma's congressional delegation was, however, successful in getting $400,000 appropriated in 1984 to continue planning and engineering work for the project.

The following year found Oklahoma's congressional delegation once again working for Mingo Creek. They were successful in lobbying for $900,000 ($400,000 over what the administration had requested) to finish the planning and engineering studies one year ahead of schedule (Duck 10/31/1985). Authorization bills, including funding for the Mingo Creek project, were passed by both the House and Senate in late 1985 and early 1986. While both bills authorized the Mingo Creek project, they differed over the amount of local cost share required (Ward 4/5/1986). A compromise authorization bill, passed in October 1986, had the local cost share at approximately 31% of the total $135 million price tag (Anonymous 10/18/1986). This authorization bill included funding to finish the design and engineering work, however it did not include funding for construction. A separate appropriations bill would be needed to provide construction monies.

While awaiting appropriation of funds, the cost-sharing issue once again became an issue. At the heart of the debate was the COE's interpretation of the 1986 Water Resources Development Act (PL 99-662) which established new cost-sharing requirements (East 3/5/1987). Three portions of the bill troubled the city: 1) a prohibition which disallowed credits for any money spent on projects prior to Nov. 17, 1981; 2) an additional 5% local contribution, and; 3) a COE interpretation that no credit is allowable if real estate costs exceed 20% of overall project costs. The COE later rescinded its interpretation on the first and third points, referring to the earlier law which allowed Tulsa full credit for its work on the project. However, the city would still have to come up with the additional 5% ($6.7 million), upping its total cost share to 38% (Martindale 3/17/1987).

Initial construction costs were appropriated in late 1987. In January 1988, the COE and the city of Tulsa signed a joint agreement outlining each entity's responsibilities in the final project (Hoffman 1/23/1988). According to the agreement, the city retained responsibility for: 1) buying land for ponds, easements, and right of ways; 2) relocating utilities and streets, and 3) disposing of waste. The COE was responsible for construction and design (aside from the city's 5% construction cost responsibility). The city raised the funds necessary for the 5% contribution through bond issues approved in late 1987 (Hoffman 1/21/1988).

In late 1988, the COE released its initial designs for the first 5 detention sites (Flanagan 1994). Area residents voiced opposition to the COE designs (America 3/24/89), which were primarily single-purpose flood control facilities (Reynolds 1994). The city's earlier efforts at building detention facilities had emphasized a multi-purpose nature, with McClure Park (Hoffman 7/22/88) and Turner Park-Rogers High School (Reynolds 1994) being the most visible. The city had even reworked a 1924 trails plan (Hinkle 1994) using concepts introduced to the city by Ian McHarg in 1968 (Flanagan 1994) to create the Tulsa Trails plan. This project would ring the city with a continuous path, beginning with a section along Mingo Creek (Anonymous 4/27/1988).

In response to citizen's complaints, the city hired local consultants to design multi-purpose plans for the detention areas. The new plans gained pubic acceptance, as one citizen put it "we should accept nothing less ... (detention facilities) need to be made an attraction, rather than a distraction" (America 3/24/1989). After questions of funding for various portions of the plan were ironed out, the plan was adopted and pursued by the COE. The project has since garnered numerous awards including a 1994 National Society of Professional Engineers Outstanding Engineering Achievement Award for innovative engineering (Anonymous 1994). The project received its final dedication in 1999 (Lassek 6/7/1999).

2.2.3 Department of Stormwater Management

Following the 1984 floods, as the city began to examine the causes and consequences of flooding, leaders realized that stormwater responsibilities were fragmented across several city departments (DelCour 9/23/1984). This fragmentation had resulted in stormwater (particularly maintenance of the current system) receiving little funds through the years (Anonymous 12/21/1984). The creation of a separate department was seen as a way to ensure that policies enacted by the current administration were adhered to in the long-run. According to J. D. Metcalfe, former street commissioner and one of the entrepreneurs, "Creating a department is the only way to maintain and guarantee a continuity in policy and procedures" (Foran 1/11/1985).

The city commission approved the creation of the department within the street commissioner's office. It also created a citizens panel, the Stormwater Drainage Advisory Board, which was to provide guidance and open decisions to public scrutiny (Pearson 1/15/1985). The mission of the new department was multi-faceted, duties ranged from enforcing the city's floodplain development regulations, to maintenance of stormwater infrastructure, to developing master drainage plans for the city's numerous water basins. Stan Williams was hired as the department's first head, meanwhile Charles

Hardt was re-hired by the city as city engineer.

The creation of the department was a relatively easy matter, funding its activities, however, would prove to be more onerous. The Citizen's Task Force on Funding for Water Drainage Problems, appointed by the city commissioners, was charged with finding permanent funding sources to improve the city's drainage system (DelCour 10/14/1984). One possibility, used in other municipalities, was to treat drainage as a utility in the same sense as sanitary sewers. A drainage fee would then be assessed from every property owner. Once again, controversy erupted. Many outraged citizens considered the fee to be an illegally imposed tax (Anonymous 4/30/1986). However, city attorney Neal McNeill studied the issue and determined that the fee was perfectly legal (Pearson 9/26/1985). The fee is used for departmental operations, enforcement of floodplain regulations, and to maintain the storm sewer network. A flat fee is charged to residential customers, while commercial development pays a fee proportional to the amount of roof and paved areas they include.

One particularly innovative aspect of the fee is the manner in which it is billed. Residents receive one utility bill from the city which includes the stormwater fee along with charges for sanitary sewers, water consumption, and refuse. Credits are applied toward the bill in a hierarchical manner, with water consumption being the last to get credit. Thus, if a homeowner disagrees with the fee and refuses to pay it, they are left with an outstanding balance on their water bill and the city can discontinue water service (McNeill 1999).

2.3 Recent Developments

In the years since the 1984 flood, Tulsa has developed a comprehensive flood hazard mitigation program which has been widely copied. In addition to the features mentioned above, the program includes a state-of-the art warning system linking rain gauges in a computerized database to increase warning times (Finlayson 3/10/1988). The city's efforts have resulted in reduced flood insurance rates and a number one rating under FEMA's Community Rating System (Anonymous 3/2/1992). In late 1993, the city reinstated the flood hazard mitigation team as the Tulsa Mitigation Team, an ongoing panel responsible for mitigation efforts. The panel works to identify potential mitigation projects throughout the city and also identify any funding opportunities which may arise (C. Williams 1995; A. Patton 1995). The efforts Tulsa has made toward protecting its citizens from flood hazards will continue to pay off for the city in years to come, as evidenced by a recent heavy rainstorm in the area (Lassek 5/10/2000).

3 Key Innovations

This section will review the key innovations identified through the examination of the Mingo Creek case. The review will focus on the policy conflicts which led to each innovation, as well as the strategies employed by the policy entrepreneurs which led to the specific innovations. Consideration will also be given to the role played by scientific/technical information (STI) in advancing the innovations.

3.1 Floodplain Management Policies

The seeds of change were planted following the floods of 1974 and 1976 when the city enacted its first floodplain management policies. "And that's when citizens and others began in earnest trying to get something done, because we didn't want things to just continue on the way they had been in the past. It was time for a change" (Flanagan 1998). The flooding crisis had forced citizens to become involved with the issues.

"Where we were coming from was: We've got to have some help folks, and we don't know what else to do except to go to our elected officials" (C. Williams 1998). Citizen involvement at that level was not readily accepted by the city of Tulsa at that time, however.

> "And they told us we couldn't participate in the meetings; we couldn't be participants. We were treated very much like second-class citizens because 'you all don't know anything.' Well, after we sat through a few hundred of the meetings, we found out they didn't know anything either. They were all just groping around out here trying to answer these questions we were asking" (C. Williams 1998).

Thus, the prevailing institutional environment was not receptive to the needs of its citizens or their calls for change. The city's opinion, based upon a ruling by the city attorney, was that water was a common enemy over which the city had no control.

This was interpreted by the city in such a manner, that, what one property owner did to "protect" himself from floods was acceptable, regardless of the effect his efforts would have upon those properties located downstream (C. Williams 1998). Indeed, the city had done little to control development or deal with stormwater issues. According to Stan Williams, the city employee responsible for writing subdivision regulations at the time, there was a "lack of requirements for new development in terms of infrastructure, particularly drainage and flood-control type infrastructure" (S. Williams 1999). Charles Hardt, then city hydrologist, stated "In fact, their stormwater criteria at the time consisted of one sheet, 8 ½ x 14 inches, and had such vague requirements that it made it almost impossible as a practicing engineer to implement" (Hardt 1998).

Following the 1976 floods, the citizens had their flood insurance to turn to in order to garner the attention of elected officials.

> "Our major question from then on was: 'How is this going to affect our flood insurance?' ... And we had asked that in public meetings all the time, so it thereby made the people here that weren't terribly interested or knowledgeable about it, they'd have to go check and see if it was going to violate the flood insurance because they were going to be held accountable" (C. Williams 1998).

After the 1976 flood, in order to remain in the federal flood insurance program, and also in an effort to quiet the vocal citizenry, city leaders were forced to enact floodplain management regulations. There was little support from the city for the policies, however.

> "The job where we rewrote the subdivision regulations, I quickly found out that nobody wanted them rewritten. So I'd spent a long time working on revising things that people didn't really want me to revise. And it wouldn't have happened, I don't think except for 1976 when it flooded again, it really gave a great impetus to the efforts that were going on. So we were successful in revising the regulations based on this really great deal of involvement by all these citizens" (S. Williams 1999).

This crisis set in motion the beginnings of the floodplain and stormwater management programs which, today, are so successful. "So, that was the start of our floodplain management program here. And essentially it was to qualify these flood prone areas for flood insurance. That was our main policy objective. And gradually, as we brought in the floodplain mapping from the flood insurance program, that led to some development controls" (LaFortune 1999).

Although the floodplain management policies which were enacted in the late 1970's were not stringently enforced by future administrations, the institutional environment was changed in that the citizens had been able to voice their opinions and influence the government. They not only changed the institutional environment of the local government, but, they had altered the institutional environment of the FIA (S. Williams 1999). Their efforts also served to raise issues which would become the center of the controversies following the 1984 floods. "It laid the seeds, I guess, that would come back later on and be very fruitful in future years. In the '70's we had talked about the fact that Mingo Creek, some of the property that had developed, the houses, they shouldn't have been there" (S. Williams 1999).

3.2 Flood Hazard Mitigation Team

While Mayor Terry Young had used flooding and drainage problems as one of his campaign issues, no one could have anticipated that he would be forced to confront the issue in such a dramatic fashion just 19 days after taking office. The team which he assembled following the 1984 floods included many of the people who had been active in earlier reform efforts. As many of these people had left Tulsa to pursue other interests, it was just "a remarkable coincidence of people being in town at that particular time who were advocates for our program over a number of years" (T. Young 1999). However, had the crisis not occurred, "I might not have tapped many of those same people to try to put into place the stormwater management system that I had proposed in my campaign. I might have used an entirely different set of people to develop those things than I ended up using after that devastating event" (T. Young 1999).

Many of the policy entrepreneurs interviewed commented, however, on the fact that it was the particular combination of people who were tapped that made innovation possible. "I'm convinced that what has happened in Tulsa since [1984] is because of that very reason. Because you had a relatively small group of people there that felt like this was the right thing to do and they would not let me or anyone else rest until everything got done that could be done" (Greer 1999). Each of these persons brought to the team individual traits which collectively helped the team succeed. Former street commissioner, J. D. Metcalfe, brought credibility to the group. "He was so well respected in the community by the different political factions that I think that made a difference" (Hinkle 1999). As a professional hydrologist, Charles Hardt brought technical know-how to the group. "I think he was, again, one of the key players because he did have so much expertise. He knew what he was doing; he knew the history; he had the scientific background" (Hinkle 1999). "He tried to find solutions that would solve everybody's problems, you know that wouldn't be one side against the other. Charles was the guy in the middle who would try to bring both sides together and find that common ground" (Flanagan 1998).

Mayor Young brought with him an attitude of being "an advocate of looking out for new ways of doing things" (T. Young 1999) which inspired him to form the advisory team. Stan Williams, in particular, was able to promote discussion on many different ways of doing things. He "was well-read [and] had some far-thinking concepts on the environmental impact of floodplain management" (Hardt 1998). Ron Flanagan, planning consultant, was perhaps the most radical proponent of change (Flanagan 1998). Carol Williams brought to the team the fear of living with flood danger on a day-to-day basis. Finally, there was Ann Patton who served as administrative assistant to J. D. Metcalfe. As a reporter, she kept the issue before the public's eye, "the public never would have known about these issues if it wasn't through the media" (Flanagan 1998). In her capacity as administrative assistant, however, she acted as the glue that held everyone together, keeping the team focused on its mission. "She always knew where we were going. I didn't always know where we were going. I just always knew that we needed to be in constant compromise" (Hardt 1998).

The individual team members also were adept at obtaining outside information.

"We had some people who knew where to point for information, too" (T. Young 1999). By the time the 1984 floods hit, "we had made our contacts, and we knew people from all over the country" (Flanagan 1998). Several of these contacts were nationally recognized academic authorities on flood control. Various team members had met with Gilbert White (a nationally known expert on flooding from Colorado) and found him very receptive to helping Tulsa work towards solving its problems (A. Patton 1999). Ian McHarg (a planning expert) had twice visited Tulsa and provided input into the direction the city should pursue (Flanagan 1994).

In addition, contacts had been made within the COE and FEMA, particularly since many of the team members were former employees of these agencies. The relationship with the COE had been forged in the late 1970's and was strengthened following the 1984 flood, particularly once the COE Mingo Creek project was funded. The COE relationship was also aided by the fact that J. D. Metcalfe and the Assistant Secretary of the Army for Civil Affairs were personal friends (Metcalfe 1999). The team worked hard to find out what the current state of knowledge was regarding the issues of flood protection. "We reached out. We talked to the FEMA people. We learned about experiences in other communities. ... We read every document. We looked at every opportunity. We looked at every option." (T. Young 1999). FEMA's willingness to be so helpful in Tulsa partially resulted from the prevailing attitudes of the time.

> "In the early days of the Flood Disaster Protection Act of 1973 our normal reaction was this is the federal government trying to force regulations on us and we're not really interested in being required to do those things. ... The unique feature of Tulsa was they were out there saying 'Yes. We know that. We want it now. What can you do help?'" (Greer 1999)

The team acted strategically while pursuing their ultimate goal of flood protection. The meetings "were not categorized as strategizing sessions. It was just 'what next?'" (Hardt 1998). The strategy which eventually developed had several key components: 1) look for opportunities to act right after the crisis; 2) garner community acceptance and participation; 3) allow the city to get financial credit for its early efforts, and; 4) ensure continuity of the program and policies through changes in the institutional environment. According to one entrepreneur "I think being poised to act quickly and take advantage of changing circumstances has been the key to our success" (Hardt 1998). Most of the subsequent innovations can be directly related to furthering one or more these strategy components.

3.3 Acquisition and Relocation

One manner in which the entrepreneurs found to act quickly was the acquisition and relocation of flood-damaged properties. Quick action was critical, "the need was to try to put into practice some of the things that we'd learned from the '70's in terms of trying to do something right after the flood, look for opportunities for mitigation" (S. Williams 1999). The crisis had intensified the entrepreneur's belief that the time was right to take action, "we looked at the political opportunity of striking while the iron was hot, and while the community was reeling over this" (T. Young 1999).

The team decided "that Mingo Creek had flooded enough, and there was no sense in building all those houses and putting them right back in place, and so the night of the flood, we started putting together maps and deciding which houses were going to stay in the floodplain" (Flanagan 1998). While other municipalities had experienced limited success with buy-out programs, the idea also had support from the residents whose homes had flooded. "The balance of more than 50% of it [the buy-out idea] came from the people whose mental health and physical health was beginning to suffer dramatically because of the stress and anxiety of being in these repetitive flooding areas and not being able to do anything about it" (T. Young 1999).

The city then imposed its controversial rebuilding moratorium, which was an option available within the existing framework of city government (Metcalfe 1998). The purpose of the moratorium was two-fold, it kept the citizens from spending their insurance money on rebuilding and it bought the city time to arrange financing for the buyouts. The buy-out proved to be quite controversial, however, as coalitions formed over property rights issues. "Interestingly, these folks were kind of trapped in those houses because they couldn't sell them on the market. But when we were proposing that we were going to move them, they suddenly became very attached to those houses" (T. Young 1999). Overcoming the resistance of the anti-acquisition coalitions took a great deal of political will (Metcalfe 1998).

> "We went to a public meeting where the people that were hosting the meeting were absolutely against the policies that were being advocated, of acquisition of flood properties and stuff. They wanted to live there, and they just wanted the problem to go away. I don't remember all the details, but in effect the person in charge on the platform made a statement, and there was a citizen comment, and to answer the question it needed the mayor, who proceeded to take the microphone and never gave it back to the person in charge ... and he sold some of those concepts" (Hardt 1998).

Aside from the political controversy the buy-out created, the entrepreneurs also had to overcome funding barriers.

> "The innovative part of Tulsa was that they found a way to obtain financing and actually perform the relocation activities that people across the country were talking about doing but were not able to do either for lack of significant interest really to get it done, or more importantly, the financing to get it done" (Greer 1999).

By declaring the moratorium, they were able to persuade FEMA to work with them to find a solution

> "we had turned to FEMA for a significant amount of assistance in funding this entire program ... FEMA deserves a great deal of credit in this particular program for being willing to try something a little bit different than they had traditionally been called upon to do in the past" (T. Young 1999).

The city had initially requested the entire cost of the buyouts from FEMA Section 1362 funds, but ended up with a compromise solution whereby each would fund half the cost remaining after insurance monies were applied (T. Young 1999). The entrepreneurs had envisioned using part of the surplus sales tax revenues to fund their portion of the buyout. Once again, they met with political resistance, and were forced to compromise (Pearson 7/12/1984). "And then we put together, again with some very innovative people, some very creative people, a way of using interest earnings on sales taxes to fund our part of it without having to take taxes away from designated projects to do it" (T. Young 1999).

Once the funding particulars had been worked out, great efforts were still required to gain public acceptance of the buy-out solution. "People said, 'You're using our tax money to buy out those house of those people there. They knew better than to build out there anyway. They shouldn't have moved in out there if they didn't want to be flooded'. We had a tough one to fight" (T. Young 1999). The entrepreneurs used the media as a means for gaining the much needed public acceptance

> "The newspapers, the editorial side of the newspapers and those commentaries that emanate from those writers became supportive of the concept. And so rather than it being such a radical proposal, it was being discussed in tone of voices that had some reason in them. And it [the media] was a great contributor to the ability to sell the program" (T. Young 1999).

3.4 Corps of Engineers Mingo Creek Project

The idea of gaining public acceptance was carried over to the development of the COE Mingo Creek project. "Part of this process was selling the detention concept to the citizenry" (Hardt 1998). In the beginning the citizens were uninformed as to the nature of the detention basins.

> "The planning that had gone into it by the COE in the '70's had been done with not much citizen participation, and the impact of the project was very wide spread. ... So one of the things that we had to do different in the '80's was we had to go out and explain to those neighborhoods what was being planned. And that became the major challenge, that I recall, is trying to make that project one that could be accommodated by the community without a real negative reaction" (S. Williams 1999).

To build public support, the entrepreneurs used an existing park which was already slated for channelization. The park was used to show the citizenry how regional detention areas could benefit the community. They used a combination of channel work and detention areas in the park, upgrading the recreational facilities at the same time.

> "And we would say, 'Look. Here's an example of how it can be done and will be done.' And it was on that good faith commitment that we were able to sell this so lightly, and go into neighborhoods and build these things next to housing developments where they were not just drastically resistant" (Hardt 1998).

Not only did the city have to gain public acceptance of the project, but they had to win over the COE as well. In the late 1970's Tulsa began to realize that on-site detention was not as effective as it had hoped and began to look at the idea of using regional detention facilities. They then garnered citizen support for the idea and approached the COE about amending their Mingo Creek plans (Hardt 1998). They initially met with much resistance from the Corps, as the Corps' standard design plan was to build concrete-lined channels (Buchert 1998). The city took advantage of some key personnel changes within the Corps (Hardt 1998; Buchert 1998), the personal friendship between J. D. Metcalfe and the Assistant Secretary of the Army for Civil Affairs (Metcalfe 1998), as well as Congressman Jones' political clout (Jones 1999) to win the acceptance of the COE.

Part of the resistance on the part of the COE stemmed from a historically adversarial relationship they had with the city concerning flood control issues. "But out of necessity perhaps, hopefully because of design, but out of necessity as well, we were reaching out to create a partnership with the Corps. They were astounded at the change in attitude" (T. Young 1999). One key tool the entrepreneurs used in developing this partnership was to include the COE in decisions from the beginning. Another key in building the successful partnership was a willingness on the part of the entrepreneurs to allow the COE to take credit for the innovative nature of the detention basins.

> "And so our bond became inseparable. We just became a true partnership. And partners meaning you don't try to stab each other in the back and you don't try to take all the credit, but you give the other person credit. So whenever the Corps would get up to speak, we were wonderful. Whenever we got up to speak, the corp was wonderful" (Hardt 1998).

The efforts the entrepreneurs made to gain favorable attention for the project also served as part of their strategy for maintaining program continuity as administrative changes were made. A final key factor in the forging of a successful partnership was the city's willingness to cooperate with the Corps on the cost sharing issues.

> "Fortunately for Tulsa, that [cost sharing] wasn't an issue because we'd had that provision that allowed us to get credit for all the work that had been done. So we didn't have any problem with the concept of cost sharing because we had already put a lot of money into it" (S. Williams 1999).

This deal, made after the 1976 floods, was essential in allowing the entrepreneurial team to forge ahead with its plans for city-wide flood control. Had that deal not been in place, the city may not have been able to fund it's portion of the cost sharing (East 3/5/1987).

The initial design the COE worked up for the detention basins were primarily single-purpose flood control facilities (Reynolds 1994). Area residents voiced opposition to the COE designs (America 3/24/89). Several of the entrepreneurs had gained familiarity with multiple-use facilities and had already applied the concept in some of the city's detention basin efforts. In the case of the COE Mingo Creek project, the multiple-use basins represented a more dramatic (due to the scale of the project) application of existing technology. The multiple-use design feature had a dual purpose. As discussed above, it eased the process of gaining public acceptance. However, it also served as a means for ensuring that program changes made immediately after the 1984 floods would not be readily changed after the flood was forgotten. "The dilemma was that as we were successful in our floodplain management activities, we were losing our constituency. And so the very people who were supporting us no longer had a vested interest in stormwater management" (Flanagan 1998). The entrepreneurs reasoned that if the detention basins served multiple purposes such as parks and open space, the community would fight any efforts to discontinue the programs supporting them. "It was strictly a preservation thing of ourselves, preserving our own objectives. In order to save the floodplains, you had to make them usable by the public" (Flanagan 1998).

3.5 Department of Stormwater Management

Along with garnering awards and ensuring the public had a vested interest in the detention basins, a third strategy for ensuring program continuity was the establishment of the stormwater department and the utility fee. "A couple of things that were intended to try to make sure those changes didn't get wiped out over time, was of course the utility fee concept, getting a dedicated funding source, and trying to figure out some way to get the effort there recognized as being successful" (S. Williams 1999).

When the entrepreneurs began studying the underlying causes for the 1984 floods, they found that the storm sewer system in Tulsa was a contributing factor. "The fact that the existing drainage system was in such poor shape was a very significant contributing factor to '84 flooding. We found many cases of channels that were so clogged with debris and growth that they just couldn't function properly" (Metcalfe 1998). While creation of the new department was relatively easy, funding its activities proved to be fairly controversial. "They weren't hearing about any new taxes, so if we played it [the fee] as a utility, people would be willing to pay for services that were being provided to them" (Flanagan 1998). The utility fee idea was borrowed from other municipalities, "It had been implemented in Bellevue, WA, and a couple of other cities" (S. Williams 1999). The fee received the endorsement of the mayor's funding task force, which later became the stormwater drainage advisory board. "We were going to look at how it [the stormwater department] should be organized and, as importantly, how it would be funded. ... and so I think that was key to have this group of citizens be the ones to make that recommendation [for the fee]" (Hinkle 1999).

Despite its successful application elsewhere, attorneys for the city continued to argue whether or not Tulsa could implement such a fee. Neal McNeill, city attorney, found a relevant precedent from the state supreme court that said a city could impose a (sanitary) sewer fee.

"I was convinced we could take that same language and apply it to stormwater

> because there is no distinction in the statute, it just says sewers. No distinction between one and the other. The rest of the department thought that it needed specific legislation to authorize it. And so I stuck my head out and wrote the opinion that said that they could impose the fee" (McNeill 1999).

The fee was one of the key long-term innovations, "the implementation of the storm water management fee was a real innovative part there [Tulsa] to create some financing" (Greer 1999). In the words of another entrepreneur, "I think it's proven to be absolutely essential to have this fee" (Hinkle 1999). Mr. McNeill also acted in an innovative fashion by expanding the billing ordinance which required credits to be applied to the storm drainage utility fee prior to crediting for water use (McNeill 1999). (This ordinance also provides that sanitary sewer and trash charges be credited before water charges.)

The establishment of the fee to fund the department necessitated the development of the stormwater drainage advisory board. "When we talked about having a fee established, we needed to do the typical structuring you would find in any governmental unit and that's to have some sort of citizen watchdog group over the expenditure of the money" (T. Young 1999). However, the group also was designed to be an advocate for revamping Tulsa's stormwater infrastructure (T. Young 1999). All three aspects, the establishment of the department, the utility fee, and the advisory board, have had a dramatic effect on Tulsa's institutional environment regarding stormwater. "It's institutionalized, the fundamental benefit" (Hardt 1998). The alteration of the institutional structure in this manner has allowed Tulsa's stormwater program to continue to grow and flourish in the years following the 1984 flood.

4 Summary

Following the flood events of 1976 and 1984, Tulsa city leaders were faced with a situation in which they were forced to develop the capacity to respond to flood issues. More specifically, the city's proven inability to protect the citizens forced response. The city experienced limited success with its initial efforts at floodplain management. The institutional structure following the 1976 floods was not receptive to citizens or their calls for change. However, they were effective in getting ordinances on the books. Thus, they changed the institutional environment somewhat.

The discussions surrounding the implementation of these ordinances lead to the development of coalitions (homeowners and developers) arguing over issues of property rights. The homeowner coalition felt that the developers were not paying the full social costs of their actions, even after the fee-in-lieu system was enacted. The developers, on the other hand, felt that they were being unfairly burdened and not being allowed to use their own property to its highest potential. The development coalition was winning, "the things that we passed in the '70's floated along, mostly not being enforced but on the books" (C. Williams 1998). This situation is proof that old paradigms die hard, and that motivation of any alternative solutions would require a more dramatic event and an effective political coalition.

The dramatic event came in the form of the 1984 floods, which were much worse than the 1976 flood. The only thing which had changed in the interim was that development had increased in the area (C. Williams 1998). As it happened, the seeds of an effective political coalition had taken office just 19 days prior to the flood. While the overwhelming devastation forced public attention on the issue, it took political courage to effect the solutions.

> "Sometimes you know what's right, but it requires people who do have the political courage to stand up for what's right, even if it may not be perceived at that time by the public or the other parties involved that this is what needs to be done. And there were individuals who did that, like the mayor [Terry Young] and like the street commissioner [J. D. Metcalfe]" (Hinkle 1999).

The personal qualities of these two entrepreneurs, as well as the rest of the team they assembled, proved to be a key ingredient in the success of Tulsa's successful innovation regarding flash flood hazard mitigation.

Another key was the ability of these individuals to utilize outside expertise, particularly scientific and technical expertise. "I think our success is several things. It is thinking ahead and having a wide, diverse group of people doing that thinking" (Hardt 1998). The entrepreneurs widened their thinking by bringing in nationally recognized consultants with previous experience designing multi-purpose detention basins. They also networked with natural hazard mitigation experts such as Gilbert White and Ian McHarg. Finally, since they knew that they could not accomplish all that they wished to within the confines of the city government, they forged a highly successful partnership with the COE, another source of outside expertise. This high level of intellectual leadership from outside the city was not evident in the other cases studied as part of this research.

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Chapter 4

The Metropolitan Environmental Trust

1 Introduction

This chapter presents the results of the retrospective assessment for the municipal solid waste recycling (Metropolitan Environmental Trust) case. The timeline developed for this case is presented in Appendix B: Municipal Solid Waste Recycling and The Metropolitan Environmental Trust Timeline.

As the narrative description of the case shows, the perception by the Tulsa citizenry of solid waste has changed over the time period examined. What was once something which was given little regard soon became seen as a potential environmental hazard. In addition, where once little thought was given to the means of disposal, the citizens now not only accept recycling, but are asking for expanded services.

The entrepreneurs active in this case wanted to achieve more than public acceptance of recycling. They wanted to do so while building a bridge between the private and public sectors. Thus, they undertook a variety of strategic actions while building the Metropolitan Environmental Trust (The M.e.t.), which were aimed at both building acceptance of recycling and achieving private sector buy-in. Specifically, they have built their program in small increments. They strategically sought functions which were not being filled by the member communities and which could be successfully done at minimal cost. This building upon their successes, one small step at a time, increased the private sector interest and response.

A second strategic move, again aimed at building private sector buy-in, has been for The M.e.t. to remain a small organization. This strategy also has the added advantage of keeping the organization from becoming a typical bureaucracy. The kinds of individuals necessary to keep this type of innovation going are extremely dedicated to their ideals, and have a strong sense of public service which surpasses their paychecks. This type of person is not generally comfortable working within mature government agencies, but prefers to "push the envelope".

This chapter first presents a narrative description of the pertinent events which took place. This is followed by a discussion of the key innovations, the barriers which were overcome in their development, and the strategies which were employed.

2 Case Description

As the 1970's began, the nation was realizing that its traditional methods of waste disposal were inadequate and that new answers would be needed. Issues pertaining to solid waste management soon began to overwhelm local governments. As a result, the federal government increased its involvement in solid waste policy making with the enactment of the Solid Waste Disposal Act of 1965 (PL 89-272, 79 Stat. 992) and later the Resource Recovery Act of 1970 (PL 91-512, 84 Stat. 1227). In addition, large private firms began offering solutions such as waste-to-energy (WTE) and mega-landfills, often forming public-private partnerships with local municipalities.

The City of Tulsa was one such municipality where public-private partnerships were thriving. In late 1972, the city refuse department collected approximately 41% of the total City of Tulsa residential refuse, with the remainder collected by private hauling companies (Patton & Stefanic 9/9/1973; Williams Brothers Engineering 1972). Solid waste collected by the city was disposed of in one of two city-operated sanitary landfills. The Mohawk Landfill, located in the floodplain on the east bank of Bird Creek, was considered full, and consideration was being given for its expansion. The Union Landfill was operated in depleted strip mining land under lease by the city, and had an estimated remaining lifetime of 2-3 years (Williams Brothers Engineering 1972). Tulsa private refuse haulers were utilizing six privately owned sanitary landfills.

By late 1973, near record levels of complaints regarding trash service were being logged by the City of Tulsa, and the refuse department was losing approximately $190,000 per year (Patton & Stefanic 9/9/1973). In addition, the Oklahoma Solid Waste Management Act of 1970 (Title 63 Oklahoma Statutes (O.S.)) charged municipal governments with developing plans to adequately dispose of solid waste generated within their incorporated limits. This act also created a State Solid Waste Advisory Committee to recommend rules and regulations to be adopted by the State Board of Health, which was granted enforcement powers.

In December of 1971, the Indian Nations Council of Government (INCOG), with grant monies obtained from the U.S. Department of Housing and Urban Development, commissioned Williams Brothers Engineering to develop both short-term and long-term *regional* solid waste management plans. Short-term recommendations were released in a report dated September, 1972 (Williams Brothers Engineering 1972). Seven of the twenty recommendations for the City of Tulsa were aimed at eliminating the operating deficit of the refuse department. The Oklahoma Solid Waste Management Act of 1970 (Title 63 O.S.) also prohibited depositing wastes in floodplains. Therefore, replacement of the Mohawk landfill with a new landfill to be located in north Tulsa was also recommended. Additionally, a second new landfill, to be located somewhere in east Tulsa, was suggested along with taking efforts to expand the life of the Union Landfill.

Perhaps the most sweeping recommendation pertained to the coordination of public and private collection efforts. The report suggested that if private collection efforts were to continue in the city, that franchised service areas be established. The city would bill customers directly and charge the private haulers a fee for this service. While alternative methods of solid waste disposal were discussed in the report, sanitary landfilling seemed to be the only option given serious consideration.

Williams Brothers released their long-term recommendations in April, 1974 (Williams Brothers Engineering 1974). Noting that little activity had occurred relative to their short-term recommendations, this report included no new recommendations for the City of Tulsa. Instead, it reiterated the need for implementation of the previous suggestions as soon as possible. It also considered the feasibility of forming a regional trust authority for solid waste, but concluded that such a venture would not be appropriate due to the lack of activity on their previous recommendations.

In contrast to the first report, this report gave much consideration to alternative disposal options such as recycling or incineration. A pilot recycling program was conducted in conjunction with the League of Women Voters, the Tulsa refuse department, the Tulsa City-County Health Department, and INCOG staff. The program expenditures far exceeded its revenues, and as a result, the report cited a low probability of success for a household recycling program in Tulsa.

The report was more optimistic, however, regarding the potential for incineration by the city. The process is explained in great detail within the body of the report, and incineration with heat recovery was cited as the most viable solid waste disposal option available to the city aside from sanitary landfills. A suggestion was made that mutual plans be developed with Oklahoma Natural Gas Company or Public Service Company of Oklahoma (PSO) as soon as possible. The report cautioned, however, that the City of Tulsa must gain control of disposal of all refuse generated within its limits before this option would become economically feasible.

2.1 Tulsa's Waste-to-Energy Plant

Soon after the release of the second study, Williams Brothers Engineering began to look into the possibility of locating a refuse-derived fuel (RDF) plant in Tulsa. In late 1977, the Tulsa Energy Resource Recovery Authority (TERRA - which later became the Tulsa Authority for the Recovery of Energy, or TARE) was formed and received a start-up loan/grant from the U. S. Department of Energy (Holmes n.d.). The authority's stated purpose was to examine the potential for an incineration plant in Tulsa. The city commissioners also served as the members of the authority. By early 1978 the Mustang RDF Co. and PSO were pushing for the siting of a boiler-fuel producing plant. The plant would collect refuse, separate and shred it at a recycling plant. Paper, wood and other combustibles would then be used for fuel at PSO's Oologah plant to generate electricity, while scrap metals would be recycled. There was much public opposition to proposed plant locations, however (Kelley 1/13/1978; Anonymous 1/14/1978).

In the meantime, the city was facing landfill problems (Pearson 5/12/1978). It was paying for a lease on one landfill which was full; under contract to take trash to another which wasn't licensed by the city and judged to be substandard by the City-County Health Department; preparing a contract to buy land for a third; and looking at a possible location for a fourth. The city refuse department was operating under a $1.7 million dollar deficit, and the city commissioners were considering a rate increase or service reduction (Rehg 6/16/1978; Marler 6/16/1978). It is within this context that the city commissioners adopted a new ordinance regulating refuse collectors which required the city's license number to be painted on all trucks, rates to be posted, a lower license fee, and a limit to the hours in which trash could be collected (Logue 6/30/1978).

Acting as TERRA, commissioners approved engineering and cost estimates for the first transfer station which would be required under the Mustang RDF proposal in November, 1978. An independent consultant's report indicated that the trash-to-fuel plan was a viable option if the city could maintain the availability of approximately 250,000 tons of refuse per year (Marler 11/19/1978). In July, 1979 the city took its first steps to gain this control when TARE requested bids for a five-year collection contract for the northeast quadrant of the city. Tulsa Refuse, Inc. (TRI), a consortium of private haulers, was awarded the contract. It was later extended to cover 75% of the city instead of the original 25%. The Mustang proposal later became infeasible, however, due to revised load forecasts by PSO. By this time the city had made its commitment to the idea of incineration clear.

In 1980, Alternate Energy Systems approached the city with a letter of intent from Sun Refining and PSO wanting to build a WTE plant. Subsequently, this firm was acquired by Midwesco, a Chicago-based engineering and construction firm. The terms of the contracts with Sun and PSO required construction to begin by May, 1984. Unfortunately, Midwesco/AES did not have the technology or funds necessary to begin construction by this deadline. In February 1984, Ogden Martin Systems, Inc. was invited to become involved in the incineration talks and suggested utilizing their proprietary Martin GMBH technology. If built, this would be the first time this European technology was used in the United States.

In order to salvage the original contracts between PSO and Sun, time became an essential component in the ensuing contract negotiations between the city and Ogden Martin. Additionally, since this was the first such plant to be built by Ogden Martin in the United States, all parties were negotiating without previous experience or historical data. The agreement which was ultimately reached to build a two-burner plant included provisions for the city to assume a major portion of the construction costs while Ogden Martin would retain ownership and operate the plant. The city also agreed to provide a certain tonnage of solid waste to the plant annually, and to reimburse Ogden Martin for some of the operating costs. TARE approved the plans in April, 1984; bonds were issued, contracts and permits renewed, and construction began within three months. In 1985, after a solid waste weighing program was undertaken, the need for a third burner was identified. The first two units became operational in October of 1986, and the third unit one year later.

From the time it first became operational, the city experienced difficulties with the WTE plant. The price of natural gas did not reach the levels which had been projected when the plant was built. As a result, the city was forced to raise the rates for residential trash collection twice between June, 1987 and April, 1989 (Buchert 1992). In August, 1988, in an effort to ensure the financial success of the WTE plant, the city passed an ordinance requiring all trash generated within the city to be disposed of at the plant (Hoffman 6/29/1988; Zubeck 1/17/1989). However, the private haulers which were servicing the city's commercial accounts were by-passing the WTE plant and utilizing cheaper landfills. In response, the city initiated the Commercial Refuse Accounting Billing System (CRABS) in April, 1989. The system was set up such that the city billed the customer for waste disposal and the hauler for collection and transportation; thus, the haulers would no longer have incentive to by-pass the WTE plant. Disposal rates were based on the type of business and the building square footage.

This system met with much opposition, culminating in a lawsuit by the Overhead Door Company which charged the city with assessing a tax without the vote of the citizens. CRABS was eventually replaced with a system based on the size of the trash container used and its frequency of pick up. The new system went into effect in February, 1991.

The political environment surrounding solid waste management in Tulsa could not have been worse. In addition to the furor surrounding CRABS and irritation of residential customers over rate hikes, the city was sued by Ogden Martin in May, 1989 over its failure to reimburse the company for sales and ad valorem taxes (as per their agreement with the city). In an effort to rectify the situation, Water and Sewer Commissioner Charlie King appointed a seven-member Solid Waste Advisory Board to review all facets of the WTE plant. It examined the possibility of purchasing the plant, altering the service contract with TRI, creating new residential service classes and altering the CRABS system. In addition, Mayor Roger Randle, having asked Ogden Martin to renegotiate the operating contract and meeting with opposition, appointed Bob Dick to examine the total solid waste disposal situation in Tulsa. Dick issued a report in July, 1990 which suggested the city implement citywide recycling to handle any solid waste generated in excess of the WTE plant capacity (Zubeck 7/2/1990). Mayor Randle (and his successor, Mayor Savage) supported recycling, but only if it would not result in fee increases. It was within this political environment that the Metropolitan Environmental Trust (The M.e.t.) was formed.

2.2 The Evolution of The M.e.t.

During the time the WTE plant was under construction, a growing awareness of the regional nature of Tulsa's solid waste disposal problems emerged. These problems included: (1) rising collection and disposal costs; (2) increasing volumes of solid waste requiring disposal; (3) difficulties in permitting and siting new landfills; (4) and a belief that the majority of the area landfills would close in the near future (due to new regulations). In response to these problems, the INCOG board of directors established a Regional Solid Waste Advisory Committee in November, 1985. Members included elected officials, employees of local governments, engineers specializing in landfill design or resource recovery techniques, private citizens, and waste haulers. Additional support was available through INCOG, the local and state health departments, and Tulsa's solid waste and legal departments. The committee's mission, originally, was to determine where to site the region's next landfills; however it quickly evolved into a broader examination of all available solid waste management alternatives.

Solutions recommended by the group were divided into the general categories of volume reduction, siting recommendations, and regulatory issues (Regional Solid Waste Management Advisory Committee 1986). In regard to volume reduction, the group suggested a 62.5% reduction in waste volume via material reuse and recycling and the soon-to-be completed WTE facility. They suggested using drop-off centers, and having some of the centers located outside the city limits (Buchert 1998). This was one of the first examples of the municipalities taking a regional approach to the solid waste problems. They also identified the immediate need for the construction of two new landfills and possibly some transfer stations, laying out stringent guidelines for landfill siting. Finally, they suggested the establishment of a Regional Solid Waste Management District with representation from each jurisdictions's Regional Solid Waste Planning Committee (to be established) and INCOG staff.

This final suggestion, in particular, was carefully researched to determine what forms of interlocal agreements were possible under Oklahoma statute (S. Young 1999). Included in the discussion of the different forms, was whether or not the decision-making practices of each structure agreed with a set of values the committee had agreed was important. The reason for the intensive study of the different alternatives was the previous failure of a regional sewage treatment authority (S. Young 1999). The INCOG board of directors had made it clear to the advisory committee that they did not wish to have a repeat of that failed project.

The structure which was eventually agreed upon became the Northeast Oklahoma Solid Waste Management Authority (NOSWMA) in February, 1988. (It was renamed The Metropolitan Environmental Trust - The M.e.t. in 1990). In the beginning, the primary focus of the organization was to continue to site new landfills (S. Young 1999). During this same time, however, groups of people were going ahead with other projects geared toward recycling. For example, Liberty Glass and the *Tulsa World* began to sponsor the "Get Off Your Glass - Recycle" campaign, with collection bells located throughout the city, and a donation made to the United Way for every ton of glass collected (Greene 2/27/1989). In June, 1988 the City of Owasso opened its recycling center, paying for recyclable items and charging less than local landfills for people to dump their trash (Martin 9/3/1989). American Waste Control began operating the Tulsa Transfer and Recycling Station, separating recyclables before sending waste to the WTE plant (Averill 5/7/1989).

These various efforts were complemented by the area's first collection event for household hazardous wastes, specifically oil and batteries, held in December, 1989 (Radzinski et al. 1990). The weekend event took place at the county fairgrounds in Tulsa, and was co-sponsored by NOSWMA, Tulsa County, and the city solid waste management department. The response was tremendous, far exceeding anyone's expectations. Shortly afterwards, NOSWMA became The M.e.t. and began searching for a new service-oriented focus (Miner 1999). It was determined that all of the member cities were interested in some sort of waste reduction program, and the focus quickly became recycling with an emphasis on public education. In June, 1990, The M.e.t. published its first regional recycling directory, providing interested parties with an easy means to locate recycling opportunities in their area (M. Patton 1995).

It quickly became clear that a one-size-fits-all solution to recycling would not be an appropriate strategy for The M.e.t. to pursue. Tulsa's WTE plant created a special set of problems which had to be overcome if a recycling program were to be successful there. In addition, several other cities were already operating successful recycling programs of one sort or another. In November, 1990 the Tulsa city council appointed a citizens committee to study recycling within the city. In May, 1991 The M.e.t.

contracted with CH2M Hill to perform a regional recycling study to evaluate regional recycling alternatives and potential markets for recyclable materials.

The Tulsa Citizens Recycling Advisory Committee released its final report in October, 1991 (Tulsa Citizen's Recycling Advisory Committee 1991). The plan called for three phases of recycling programs to be adopted, with each followed by an evaluation of participation and affordability. The first phase was to include three to four drop-off centers located throughout the city. Nine to twelve months later, this would be followed by a pilot curbside program. Finally, curbside recycling would be made available to all Tulsa citizens within two years from the date the report was released. The report was met with mixed reactions by the city administration. However, it did hire its first recycling coordinator (Michael Patton) in April, 1992. His two primary missions were public education and the study of possible recycling programs which the city could adopt (M. Patton 1998).

Meanwhile, The M.e.t. underwent a change in leadership, as director Susan Young was replaced by Roger Miner. The organization had continued to sponsor bi-annual household hazardous waste collection programs at the county fairgrounds, adding antifreeze collection. By surveying the patrons of these events, it was determined that many of the surrounding localities would be better served by an opportunity for similar events closer to home. With this in mind, The M.e.t. took the program on the road to Bixby with a portable recycling trailer in May 1992 (Colberg 5/28/1992). At the same time, it also proposed building a permanent collection center at the fairgrounds, which would begin by collecting just oil, antifreeze and batteries, but soon expand into a recycling buy-back center.

The final CH2M Hill report was released in September, 1992, (CH2M Hill 1992) and an implementation task force was formed to plan a recycling program. Meanwhile, a private recycling firm wanted to begin curbside collection of recyclables in Tulsa, but was told that the trash belonged to the city and no one other than TRI could pick it up (Elliott-Basmore 9/7/1992). The City of Tulsa seemed to be sending mixed messages regarding its commitment to recycling. At the same time it was hindering the recycling businesses from picking up waste, it was attempting to stimulate the market for recycled paper products by issuing an executive order giving preference to recycled paper.

By November, The M.e.t.'s implementation task force had finished its work and recommended a regional approach to recycling with Tulsa acting as an anchor for area drop-off centers (The M.e.t. Implementation Task Force 1993). While the CH2M Hill report showed that a reduction in yard waste would have a greater impact on the waste stream, it was felt that regional drop-off centers would be the best way to begin as the public was more familiar with this, more traditional, form of recycling (CH2M Hill 1992). This was also a solution which was entry level and required as little capital investment by the member cities as possible. The idea was presented to the Mayor (Susan Savage) who responded favorably and asked if used motor oil could be collected at the drop-off centers (M. Patton 1998). The drop-off center plan was approved (including provisions to accept used oil) by the member communities in December, 1992.

The idea was to start slowly, only collecting a few items and adding additional capacity over time (M. Patton 1998). A key to keeping the capital costs low was to design the centers around easily transportable trailers which are used as collection bins. The first center opened for operation in April, 1993, while The M.e.t. sponsored what it thought would be the last oil, battery, and antifreeze collection event. In July, the city and The M.e.t. co-sponsored the "7 Days Not to Waste" public education campaign as a formal kick-off to the recycling centers (Colberg 7/25/1993). The event included demonstrations of how to prepare materials for recycling, a series of newspaper articles, discussions about earth-friendly alternatives for the house and garden, environmentally friendly shopping advice, grasscycling and composting demonstrations, and landfill tours.

The centers were a big success; however, it was quickly determined that attendants were spending too much time answering questions, instead of sorting materials. The decision was made to add an information kiosk at each center. In addition, it was realized that the need still existed to hold the household hazardous waste collection events. So, in October, 1993, another collection event was held; this time adding pesticides, paint and other types of household chemicals. This was the first time in the State of Oklahoma the public was given an opportunity to recycle such materials (Gilroy-Gibson 10/31/1993). There are currently 10 centers in operation throughout the Tulsa metropolitan area.

The centers have proven to be a good way for the area to begin its recycling efforts and educate the public about solid waste. They require little capital investment, yet are flexibly designed so that they can be tailored to fit each individual city's needs. True to its original plan, in the years since the drop-off centers began operations The M.e.t. has continued to add to the list of items collected. The centers now accept used eyeglasses in conjunction with the Lions Clubs (Rasheed 6/4/1997). In addition, some centers (where a need was identified) also accept steel cans. Another innovation has occurred in the household pollutant collection events. Used paint collected at the events is now offered for redistribution (free of charge). This places the emphasis on the preferred hierarchy of reducing, reusing, and then recycling. This serves as a very valuable method to inform the public and start them thinking about the hierarchy. Most recently, in June, 1998, The M.e.t., in conjunction with Budweiser and Smithey Environmental, began its "Barrels Behind Bars" campaign, supplying local businesses with collection barrels for bar glass (Mulkins 6/29/1998).

3 Key Innovations

This section will review the key innovations identified through the examination of Tulsa's solid waste disposal situation. The review will focus on the policy conflicts which led to each innovation, with consideration being given to the role played by policy entrepreneurs and scientific/technical information (STI).

3.1 TERRA and the WTE Plant

The first key solid waste innovations present in Tulsa are the formation of TERRA and the eventual building of the WTE plant. TERRA is considered crucial in the eventual development of The M.e.t. because it publicly signaled Tulsa city leader's commitment to incineration as a means of handling its waste. Later, as The M.e.t. began its discussions of recycling options for the area, the WTE plant and its flow requirement would become potential obstacles to the success of a city-wide recycling program.

One of the key issues facing the city's leaders at this time was the realization that current landfill capacity was inadequate and that the public greatly opposed the siting of new landfills. The studies conducted by Williams Brothers in 1972 and 1974, emphasized the inadequate nature of the landfills the city was utilizing at that time (Williams

Brothers Engineering 1972; Williams Brothers Engineering 1974). The Mowhawk Landfill, which was nearing capacity, was located in a floodplain. The city lost its lease on the Union Landfill site in the fall of 1977, and began utilizing a temporary site adjacent to it. In January, 1978, the city commission was looking at a potential landfill site in Wagoner County, the third site to be considered in a year's time (Anonymous 1/14/78). Earlier potential sites were dropped from consideration due to public objections.

The conflict over potential landfill sites continued to grow throughout much of the late 1970's. Management of this conflict marks the first use of scientific/technical information in The M.e.t. case study. The Williams Brother's studies utilized both soil type and floodplain maps in determining potential sites for new landfill construction. In addition, the second study presented a scientific analysis of different waste disposal techniques. The record indicates, however, that the information germane to landfill location was not used to effectively reduce conflict. "They never did come up with a site; never did build a landfill" (Buchert 1998). This forced city leaders to give serious consideration to alternative waste disposal technologies (particularly incineration).

On the other hand, the city was quite successful in using the scientific/technical information regarding incineration to redefine the solid waste problem from one of siting new landfills to one of financing an incineration plant. Newspaper articles were particularly useful in changing the nature of the problem. With headlines like "City Still Faces Problems With Landfills" (Pearson 5/12/78) and "City must find landfill site quickly" (Anonymous 5/13/78), they served to reinforce in the public's mind the idea that a landfill crisis existed and incineration was the most viable option out of the crisis.

In addition, many editorials appeared clearly promoting incineration (see for example, Anonymous 1/14/78; Boone 2/6/78). From the city's perspective, incineration was a "technological solution" to the landfill crisis. In reality, it only served to postpone the need for the city to give serious consideration to recycling. In addition, it was a solution which was only available to residents of Tulsa, but something which had to be considered when The M.e.t. was devising regional recycling strategies.

In addition to the public's protests regarding the location of new landfill sites, the city commissioners were also forced to contend with a growing discontent with the solid waste services provided within the city. Service was being provided chaotically by both the city and private contractors. Some customers were having difficulty obtaining service in areas not served by the city. This problem was particularly acute in remote areas where the driving distance made it financially unfeasible for private haulers to operate. In addition, the city refuse department was continuing to operate under a deficit and was considering cutting services or raising rates (Rehg 6/16/78). Conflicts arose both among the commissioners and between the commission and the city solid waste director over how to deal with the discontent and financial difficulties. The authority appears to have provided the commissioners with a forum in which to deal with this conflict while insulating themselves from political repercussions.

The formation of TERRA required overcoming no political or bureaucratic obstacles. The city commissioners were free to form the authority. Within such a non-political framework, they were more free to explore the potential implications of adopting incineration technology. Conflict in this instance surrounded the potential locations of recycling plants required under the Mustang RDF proposal. One particularly important conflict arose when residents of a north side neighborhood found that preliminary studies indicated it was a potential recycling plant location (Kelley 1/13/78).

In December, 1977 the Tulsa Urban Renewal Authority sought permission to re-zone the property from the light to medium industrial category. The neighborhood residents perceived this act as part of a secret scheme to locate the plant without their involvement and consent. Adding fuel to the fire was the appearance of a memo which implied Mustang would begin a public relations campaign to sell the site to area residents. The company did admit, however, that it planned to step up its efforts to sell the concept of refuse-derived fuel to the city. The memo prompted Mayor Robert LaFortune to assure the public that the authority had not undertaken final site selection. The site had, thus far, only been used for planning purposes to investigate the feasibility of the concept. The formation of the authority was a strategic move by entrepreneurial city officials aimed at easing the process of bringing RDF technology to Tulsa.

By giving TERRA revenue generating powers and thus, the ability to finance the plant, the city commissioners had only to worry about site selection. It was thought at the time that it would be easier to site a recycling plant than a landfill. The commissioners did not have to look too far afield to observe how onerous recycling plant site selection could become, however. United Electric Co. had previously tried to site such a plant in St. Louis and been unable to do so (Boone 2/6/78). That city's leadership, still facing refuse problems, was reviving the idea in early 1978, but without the aid of an authority specifically designed to carry out the plan.

In the end, the Mustang proposal became infeasible due to revised load forecasts made by PSO, and TERRA never had to actually site a recycling plant. The failure of the

Mustang proposal did not mean the end of the concept of solid waste incineration for Tulsa. TERRA survived as TARE; and in April of 1984, the second key innovation was approved by the authority. This was the mass burn incinerator, or WTE plant, which was eventually built and operated by Ogden-Martin.

3.2 The Waste-to-Energy Plant and Flow Control

The building of the WTE plant appeared, on the surface, to have solved Tulsa's solid waste problems. However, in reality, it simply postponed the need for Tulsa to find new landfill space. In addition, the city was required to deliver a certain tonnage of solid waste to the plant annually, the so-called "put-or-pay" clause. Initially under this clause, the city was often having to pay due to inadequate amounts of trash being delivered to the plant. This situation led to the next innovation, the 1988 passing of the ordinance (Ordinance Number 17426) which required all solid waste generated in the city to be disposed of at the WTE plant. When this ordinance was first enacted, many of the private haulers, in an effort to save money, ignored the requirement and continued to dispose of commercial trash at private landfills. In response, the city initiated its CRABS billing system.

The rationale behind the CRABS system was that the city would gain economic flow control over the waste stream. The problem then became one of determining equivalent service units for which to bill. The city had previously been successful with the stormwater utility fee, and envisioned using a similar fee for trash. In the words of one policy entrepreneur, "So the idea through a small brainstorming session was if storm water can do it and have an equivalent unit, why can't trash do it?" (M. Patton 1998). The new charge was for the disposal of trash, not the collection. After a pilot study was conducted, it was determined that the amount charged would be based on type of business and size of building. "In trash, obviously there's some business variances. A warehouse will produce less trash per square foot than a restaurant would" (M. Patton 1998). The city felt like too many categories would make the system too complicated. It therefore placed all businesses into one of 10 categories (M. Patton 1998). It was clear from the outset, that 10 categories were not enough, and that more information was needed regarding Tulsa's commercial waste stream.

The trash haulers were very receptive to the new system, because it allowed them to dump for free, reducing their operating costs. "And so Tulsa was able to have a dynamic where the government got involved, the citizens felt like there was more control over trash, and the haulers felt like we were partners in billing and allowed them some profit" (M. Patton 1998). The business community, however, was adamantly opposed to the system. CRABS eventually led to a lawsuit against the city, in which the Overhead Door Company claimed the city was assessing a tax without the vote of the people. Due to the nature of its business, this company generated almost no onsite waste. Under the CRABS system, however, they were being charged for disposal, a charge which they felt was unfair. The nature of Tulsa's billing system forced the company to continue to pay the fee while protesting it in the courts. "If you pay partially on your bill, they take the money off the other areas but not your water. So any arrears amount is considered arrears on the water, and they'll shut your water off" (M. Patton 1998).

The suit, which became a class action suit, was eventually settled (*Overhead Door Co. of Tulsa, Inc.* v. *City of Tulsa* 1991). The terms of the settlement required the city to enact a new commercial billing system by February 1, 1991. The new system bases the charge on the number of container yards of refuse disposed of per month. The entrepreneurs were able to use the debate over the CRABS system to their advantage. "[But] bottom line, people became more aware of their trash stream, and that was one of our goals" (M. Patton 1998). In addition to the debate serving an education role, the system which was enacted as a result of the settlement allowed for the gathering of technical information regarding the nature of the commercial waste stream which was previously unavailable. "The haulers in some cases had maybe a card or 3 x 5 notes of where they picked up trash. The guy knew where to drive but their billing and everything else was pretty low tech, and probably not very accurate" (M. Patton 1998). The new system forced the haulers to quantify the waste streams. The large number of small haulers operating in Tulsa allowed the entrepreneurs to use their strategy of encouraging private-public partnerships to obtain this information. "Two policemen in town set up some software programs on their own as a small business and went around and helped (the haulers) install them" (M. Patton 1998).

The furor over the CRABS system is a typical example of the sharp value conflicts which often come into play during environmental policy development. Firstly, the lawsuit was representative of the continual dialogues over the nature of government involvement (M. Patton 1998). The business community clearly did not want the city to tell it what to do with its trash. Secondly, it was felt that the city had no right to levy a charge on business simply for generating solid waste. These value conflicts represent serious impediments to the successful implementation of a solid waste recycling program.

Flow control in Tulsa exhibited many of the characteristics identified in the literature review as key to social learning. First, the institutional environment was changed when the city took over billing for disposal of trash. Second, both scientific/technical information and values played a role in the formation of the ultimate solution. Both the initial CRABS system and the current rate system are based on technical information such as the nature of the waste stream as generated by different types of businesses, and a compaction factor for accounts serviced by compaction trucks. Values and beliefs were incorporated in the system as a result of the lawsuit brought forth by Overhead Door Company. The city was successful in overcoming this obstacle to flow control through its willingness to work with the parties involved, particularly the Chamber of Commerce (M. Patton 1998). Finally, the innovation was indeed precipitated by a crisis, the crisis of not having the volume of trash disposed of at the WTE plant required in the operating contract.

3.3 NOSWMA and The Metropolitan Environmental Trust (The M.e.t.)

The building of the WTE plant had eased Tulsa's solid waste worries, but only temporarily. The city still needed to landfill the ash and was running out of places to do so. In addition, by the late 80's/early 90's, the city was often generating more trash than the WTE plant could handle and was paying to landfill the excess. Landfill capacity was a problem not only for the city of Tulsa, but for many of the other municipalities in the region. The feeling that landfills were going to be in short supply was a nationwide phenomenon resulting from recent changes in federal legislation. "In response to that there was a real commonly agreed upon policy judgement that government needed to get its act together and begin to respond by having a formal organization that would literally go out and try and permit a landfill and build it" (Miner 1999). Clearly, more landfill space was needed, however, siting would be difficult. "The INCOG member governments had citizens who were very upset about the INCOG landfill siting process, and those member governments were expressing those concerns to the INCOG staff..." (S. Young 1999).

INCOG, wanting to address the problem, decided to form a citizen's advisory committee to look at siting issues, a solution with which they had had much success in the past (S. Young 1999). The committee developed a landfill siting process, based upon sound scientific/technical information and value criteria (S. Young 1999). Even though the proposed sites were based on both scientific information and values, no landfills were ever sited as a result of the process. However, in the words of one entrepreneur, "that process under INCOG led to larger questions that really began to get people like myself who were city managers in the area to begin to be a little more informed about those issues and to begin to meet and talk among ourselves about them" (Miner 1999).

The committee also suggested the formation of a permanent body which would be responsible for solid waste issues. Due to the failure of a similar board for sewage treatment some years earlier, a concerted effort was made to research the types of entities which were allowable under the Oklahoma constitution.

> "So the citizens committee was charged to research various forms of interlocal agreements, joint powers agreements. What was possible under Oklahoma statute and what was possible under the Oklahoma Constitution because we didn't want to do anything that would require constitutional changes, but we would have considered things that might take relatively minor legislative changes" (S. Young 1999).

The structure which was eventually agreed upon became NOSWMA (later The M.e.t.), its mission was comprehensive solid waste policy for the region. "I really think it was a creature of the folks who were the leaders in the various communities in the Tulsa metro area" (Miner 1999). This is the next key innovation in Tulsa's solid waste case.

One of the first obstacles which needed to be overcome by The M.e.t. was a hesitancy on the part of the member governments to accept a regional board. "There was not a real friendly relationship between Tulsa and its suburbs" (S. Young 1999). As a result, much of the initial efforts were spent on educating the communities about the nature of the authority and its activities (S. Young 1999). Particularly, getting the city of Tulsa to buy into the structure of the authority. "What the goal of the citizens committee and the INCOG board when they signed off on the structure was a one-community, one-vote decision-making entity, and a contribution of finances on the basis of population" (S. Young 1999). The authority was quite effective at educating the public, not only about the nature of their activities, but also about *all* issues regarding solid waste.

The local media, particularly the *Tulsa World*, was particularly helpful in gaining acceptance of The M.e.t. and its various programs. What had begun as an adversarial relationship, "I think the newspaper in terms of The M.e.t. when it first started... was a killer. No matter where they came up with a site, no matter what, the newspaper seemed to print all the most negative things about that..." (Buchert 1998) was now a supportive one. "*The World* was very, very helpful in the public relations aspects and in the public opinion shaping, and in educating the people about solid waste issues" (S. Young 1999). One entrepreneur remembers a meeting being held to discuss the drop-off centers which the head of the newspaper attended. In this particular meeting, The M.e.t. was able to announce a drop-off center location which Goodwill Industries had been trying to procure for many years. "This was a crucial meeting because if we had left this meeting with things unresolved, he would have instructed a reporter to write a negative story about it, I think" (M. Patton 1998). In this case, the lack of negative publicity acted in interest of the entrepreneurs, enabling the program to move forward.

In addition to educating the members on the nature of the authority, The M.e.t. also had to educate them on the nature of solid waste.

> "We developed an actual course in solid waste management. And we taught them about recycling and taught them about markets and transportation of recyclables and being able to ... you know, you can't pick it up if you can't put it down. And we talked about some harmful hazard waste issues. And we talked about yard wastes and yard waste composting issues. And we talked various kinds of recycling programs. Whether they would be curbside programs or drop off programs" (S. Young 1999).

In order to educate the members, Ms. Young herself had to become an expert in solid waste issues. "I worked closely with a lot of the haulers in the Tulsa area ... and they took me to school on the back of their trucks" (S. Young 1999). Another entrepreneur, speaking of Ms. Young's personal education said "if you went into her office at that time, she had stacks and stacks of stuff... insatiable appetite to read the periodicals in those areas of interest. So she was very well versed on technical issues, policy issues, and that kind of thing" (Miner 1999). As the members began to understand solid waste more thoroughly, their perception of the problem changed. "We began to see a big part of the problem that we had, not so much in finding a place to bury trash, but in beginning to change real bad habits that people had as waste generators." (Miner 1999).

At the same time, some members began to get involved in some specific recycling projects, including Broken Arrow's "Leave it on the Lawn" campaign, drop-off programs in Owasso and Sapulpa, and a pilot curbside recycling project spearheaded by a private collector (S. Young 1999). In addition, The M.e.t. continued to co-sponsor household hazardous waste collection events. Part of the impetus for these events was a requirement from the EPA. "And one of the things that Region Six EPA thought ... they had a director down there, and I don't remember his name, but he was very impressed with Kansas City's household-pollutant collection program. So he wanted that in our stormwater NPDES program... so we said 'Okay. We'll do that'" (Buchert 1998). The program, which relied heavily on corporate sponsorship, was well received. "It was incredibly successful, but it showed some interagency cooperation was possible. And it brought in some players from the various communities around the area as being able to cooperate on solid was management issues" (S. Young 1999). Several key aspects of the strategic plan were now in place. Corporate ties had been built, which could be accessed in the future as the need arose. In addition, the member communities were beginning to believe that cooperation was possible. Finally, the tremendous response to the events made it clear to the political decision-makers that recycling was an issue which demanded their attention.

As time passed, and landfill siting was no longer a priority, The M.e.t. began to search for an identity (Miner 1999). As part of the search, the authority decided that it needed to "try and be a little more scientific about the nature of the crisis and the nature of the problem, and not be quite so quick to presume that we understood the dimensions and the nature of the crisis" (Miner 1999). A study was conducted to determine the nature of the waste stream and the impacts different waste reduction schemes would have on the waste stream. (CH2M Hill 1992). According to one entrepreneur, the study was intended to serve three purposes:

> "The study was intended to identify the nature of the ... CH2M Hill study was intended to identify a lot of things. At that time we thought: Boy, we really need to understand our particular waste stream here in this area. We need to understand it real well.... We also wanted to know about generation rates and how they change from jurisdiction to jurisdiction within The M.e.t., and we learned that. And then we also made a stab at gauging the potential using different mechanisms to have effective waste reduction of one kind or another in each jurisdiction. That was really an important component of that study" (Miner 1999).

This component was particularly important from the perspective of the city of Tulsa. Any recycling effort which was adopted could not adversely affect their contract to provide a certain amount of waste to the WTE plant. Therefore, without the assurances of non-interference provided by this study, the city of Tulsa would not have readily participated in the drop-off center program. Any solution which was adopted would most certainly need buy-in from the city to be feasible. Once again, the authority had set out to generate information which was previously unavailable to them, yet critical for decision-making to proceed. This information was needed in order for them to advance their strategy of only choosing projects which they felt they could do successfully (Lasker 1999).

In addition, the member communities were polled to determine what gaps in service existed. "Well, real quickly we could see that every single community shared one thing, and that was a robust interest in recycling, in recycling services" (Miner 1999). Again, the choice to take on recycling fit with the entrepreneurs' overall strategy. "And it was a case of being able to get people comfortable with some very no-cost projects for a couple of years so that we didn't have to make any difficult or hard-core decisions that would stress the relationship that was developing while folks got comfortable with this M.e.t. thing" (S. Young 1999). And so, provision of household recycling services became the mission of The M.e.t.

An implementation task force, consisting of representatives from each of the member communities, was formed to determine the how The M.e.t. would enter the recycling business. Eventually, they agreed upon the drop-off centers. At the same time, the city of Tulsa was undergoing a public debate about recycling. The city formed a citizen's recycling advisory committee to study the issue. It was felt that if Tulsa independently pursued its own strategy, this might hamper the efforts of The M.e.t. to establish business at it's drop-off centers. Concern was especially high since Mayor Savage had expressed interest in foregoing drop-off centers and proceeding directly to curbside recycling (The M.e.t. Implementation Task Force 11/2/92). It took a politically astute entrepreneur (Jerry Lasker, Executive Director of INCOG) to get the city to finally buy into the drop-off center plan. "Lasker got the city and the county, mostly by having the county put pressure on the city to buy into this" (S. Young 1999). The first center was opened in April 1993, in the city of Tulsa.

The establishment of The M.e.t. exhibited many of the characteristics identified in the literature review as key to social learning. The initial committee set up by INCOG was put forth to address a perceived "landfill" crisis. The problem was then redefined from one of siting a landfill to one of managing the region's solid waste stream in a comprehensive manner. Enduring behavioral changes are evidenced by the numbers of patrons which the drop-off centers receive.

The institutional environment was forever changed by the formation of The M.e.t. and its mission as the authority to deal with solid waste issues. Scientific and technical information was very much a part of the discussions surrounding the drop-off centers and recycling. In the words of one entrepreneur, "we learned that we needed to try and be a little more scientific about the nature of the crisis and the nature of the problem..." (Miner 1999). Values were taken into consideration by polling the member cities directly to determine what issues they wanted The M.e.t. to address. The centers take a systems approach to recycling, with each location catering to the specific needs of its geographical area. Technical expertise was utilized in determining the nature of the problem and potential solutions, political expertise was used to persuade the city of Tulsa to work within a regional framework. Finally, The M.e.t. provides a shining example of successful coordination of many levels of government and agencies.

4 Summary

This chapter summarizes the key innovations in municipal solid waste recycling policy developed by the city of Tulsa over the last 20 years. Solid waste policy innovation by Tulsa did not conform to either the "groping along" or "policy planning" models as they are outlined in the current literature (Behn 1988; Berman 1980). The model which seems to best describe the policy innovations which took place in this case is the "strategic innovation" model (Deyle 1994).

In the case of groping along, as with the solid waste case in Tulsa, policies undergo continual refinement once they are placed within the context of their operating environment. However, in the groping along model, the policy modifications are not aimed at advancing explicit policy goals or strategies. It is clear from the discussion above that the policy entrepreneurs active in this case were acting in a strategic manner. Three key elements of the strategy were: (1) building partnerships with the private sector; (2) gaining a large number of participants in order to secure political buy-in; and (3) building upon successes one small step at a time.

The household hazardous waste events represent perhaps the most striking example of private-public partnerships undertaken in this case. The event, which initially was envisioned as being open only to residents of Tulsa continues to get support from residents of the outlying communities (Buchert 1998). The role played by such partnerships in the continued success of The M.e.t. has been critical. In the words of one entrepreneur, "It was very much a consensus building process ... a synergy that developed that ... contributed to the 'Hey. See what happens when folks work together. Look at the potential here. We have some problems that we could get solved'" (S. Young 1999). One strategy which has helped to foster such partnerships has been for The M.e.t. to remain a small organization. "The Metropolitan Environmental Trust has two employees, Michael Patton and a secretary. Everything else is done by contract. That's the way right now we want to keep it" (Buchert 1998). While the member governments are willing to lend support recycling efforts, they are not financially able to fully fund the efforts which have been undertaken. By strategically utilizing public-private partnerships, The M.e.t. has been able to supply solutions which require minimal financial investments on the part of the members.

The partnership mentality dominates the relationship between The M.e.t. and the recycling public as well. "We've developed a relationship with the public that we don't have a lot of money, you have to do most of the work yourself, but we'll find you an answer" (M. Patton 1998). This relationship has helped to both foster The M.e.t.'s reputation as the provider of environmental services and to increase the public's participation rate.

> "And now our... I guess I'd say "perception", the public's perception of us is that the mess involved must be an incredibly environmental thing. So we're asked to do a lot more work than we possibly have opinions on. We are drug into landfill gas issues and ozone meetings and everything else because we have some credibility" (M. Patton 1998).

Much of the credibility of The M.e.t. is a result of the last part of their strategy, to build upon successes one small step at a time. However, strategy alone was not sufficient to build the reputation which The M.e.t. has garnished. A certain type of person is also needed in order to successfully execute the strategy. "Again, it gets down to the people who are involved in this, and how they can manipulate the system and get people to do things" (Lasker 1999). This case serves to show that the "or" in the previous sentence should be changed to an "and". Not only does it take persons who are comfortable in the political arena, but these persons must also be able to function in the bureaucratic arena as well.

> "But there appears to me to be two kinds of folks that I needed to move public policy. And one of those kinds of folks is an intensely political – and by that I don't mean party politics, but political in terms of knowing personal relationships between people; what values individual people have; what values individual people hold; what strings individual people have, and the knowledge of that type of information so that you can develop coalitions and develop consensus. The other kind of person that you need almost an evangelist – someone with perhaps a vision and a drive and desire and enthusiasm to drive, to keep pushing and to be almost a cheerleader of a project" (S. Young 1999).

The case of municipal solid waste recycling in Tulsa was lucky to have had both types of persons active as entrepreneurs.

While the efforts undertaken in this case were definitely strategic in nature, they were not so to the point that the policy planning model of innovation is aptly descriptive. Extensive examination of the outcomes of potential actions were not examined. Detailed implementation plans did were not drawn up and followed. When queried about how The M.e.t. determined where to go from the early successes, one entrepreneur responded "What can we do that's cheap, and what can we do that we can raise money on, and what can we do and do well?" (S. Young 1999). The expected response under the policy planning model would have been "What outcomes most closely match our policy goals, and what actions achieve those outcomes?".

Final support of the strategic policy innovation model is supplied by the important role played by scientific and technical information in this case. Specific technical information regarding solid waste and recycling was needed in order to educate the public and government officials about the programs The M.e.t. undertook. This information was gathered from technical journals, scientific papers, as well as waste haulers themselves. Additional information regarding the precise nature of Tulsa's waste stream was needed for decision-making. This information was not readily available to the entrepreneurs and was generated over the time period covered by this case. The CRABS system and its replacement allowed the city to quantify and characterize the commercial waste stream. The studies undertaken by CH2M Hill and the Citizen's recycling committee generated specific information regarding the nature of residential waste streams in the municipalities. This type of information was critical to estimating the impacts of proposed policies, and would not have been used in the groping along model.

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Chapter 5

Ozone Alert!

1 Introduction

This chapter presents the results of the retrospective assessment for the Ozone Alert! case. The timeline developed for this case is presented in Appendix C: Ozone Alert! Timeline.

In contrast to the Mingo Creek and Metropolitan Environmental Trust cases, which were crisis driven, the driving force behind this case was compliance with environmental regulations. However, the fear that Tulsa could potentially violate these regulations in the near future, resulting in economic penalties, created a crisis-mentality in the minds of many entrepreneurs. The possibility that federal regulators might impose their own compliance strategies served as an impetus for the private sector to "buy into" the programs promoted by the policy entrepreneurs active in this case. The threat of the "federal hammer" has also served as a key component in keeping the public's attention focused on air quality issues to a much greater extent than the health effects associated with "dirty" air.

The result of Tulsa's efforts to remain in attainment for ozone is a compendium of voluntary measures which are to be taken by the participants on an "as-needed" basis known as the Ozone Alert! program. However, scientific certainty did not drive the choice of actions. While there are some indications as to the nature of Tulsa's ozone problem, much uncertainty still remains. Along with science, economics, i.e. what measures the city could undertake inexpensively, played a large role in determining the measures to be included in the Ozone Alert! program.

The voluntary and episodic nature of the program indicates willingness on Tulsa's part to make some short-term adjustments which are required to become sustainable. However, it is unclear what long-term adjustments, many of which are also required for sustainability, the city is willing to take. Another facet of sustainability which is evident in this case is the creation and maintenance of successful partnerships. The ability of the entrepreneurs to forge these partnerships is well documented in the case presented below.

2 Case Description

The first federal Clean Air Act (CAA) (PL 88-206) was passed in 1963 in an effort to improve the nation's air quality. The CAA amendments (CAAA) of 1970 (PL 91-604), however, effectively rewrote the act (Plater et al. 1992). The 1970 CAAA established National Ambient Air Quality Standards (NAAQS) specifying maximum levels of six criteria pollutants for outside air. Ozone is among the six criteria pollutants regulated under the CAA. In the mid-1980's, Tulsa was designated as a "non-attainment" area for ozone (Travis et al. 1996). Non-attainment designation for an area occurs when the air fails to meet the NAAQS for any given pollutant.

Ozone is a highly reactive form of oxygen (O_3), colorless and odorless at normal ambient concentrations. At higher concentrations, ozone is a blue gas with a pungent odor. Unlike other criteria pollutants, ozone is not emitted directly into the air. It is formed through chemical reactions of oxygen and nitrous oxides and volatile organic carbons in the presence of sunlight (Oklahoma Dept. of Environmental Quality 1996). Ozone may cause adverse health effects because it is known to damage lung tissue, reduce lung function, and sensitize the lungs to other irritants. Lung damage can result from both acute and chronic ozone exposure. Animal tests indicate that prolonged, chronic exposures can result in structural damage to the lungs (Oklahoma Dept. of Environmental Quality 1996). Elevated levels of ground level ozone has also been known to affect the ecosystem. Plants such as soy beans, alfalfa, corn, oats, and deciduous trees are especially sensitive to low levels of ozone (Oklahoma Dept. of Environmental Quality 1996). The fact that ozone, unlike some other criteria pollutants, is a public health threat helped to motivate public response to the Ozone Alert! program.

During the late 1980's designation as non-attainment was hurting Tulsa economically, as new manufacturing facilities were effectively prohibited from locating in Tulsa (Anonymous 4/18/1989). By 1989, Tulsa believed it had sufficient data justifying its removal from the non-attainment list. The U.S. Environmental Protection Agency (EPA) would not remove Tulsa from the list due to disagreements over the state's air quality improvement plan (Johnson Adams 6/1/1989; Fox 6/14/1989; Everly-Douze 8/2/1989). In response, an Air Quality Task Force, consisting of representatives from Tulsa businesses and government, as well as air quality experts was formed to enlist the aid of Tulsa's congressional delegation in pressing EPA to take Tulsa off the non-attainment list (Pinc and Lasker 1998; Johnson Adams 9/20/1989; Martindale 9/21/1989).

One congressman who was particularly important in this regard was U.S. Rep. Mike Synar, D-2nd District, who was a member of the House subcommittee drafting the CAAA of 1990 (PL 101-549). "Mike Synar was very instrumental in getting that done (JL)" (removing Tulsa from the non-attainment list) (Pinc and Lasker 1998). Rep. Synar was instrumental in getting all of the key parties to meet and discuss potential measures which would ensure Tulsa's redesignation as an attainment area. Through the efforts of several key congressmen and senators, Tulsa was able to delay the signing of the 1990 CAAA (Henneke 1999). As a result of this political pressure, Tulsa was officially removed from the non-attainment list on October 30, 1990 (Associated Press 11/1/1990), prior to the enactment of the CAAA on November 17, 1990.

In June of 1991, Tulsa experienced an exceedance of the ozone standard, its third in three years (Anonymous 6/25/1991). The existing regulations allowed cities to exceed the standard only three times at any given monitoring station in a three-year period. Thus, if Tulsa were to have one more exceedance in 1991, it would have violated the standard and could potentially be redesignated as non-attainment. A decision was made to reinstate the INCOG Air Quality Task force in order to examine strategies for remaining in attainment (Pinc and Lasker 1998; Selph 1999).

2.1 The Ozone Alert! Program

The reinstatement of the Air Quality task force as the INCOG Air Quality Committee resulted from conversations which took place between INCOG Executive Director Jerry Lasker, Tulsa County Commissioner John Selph, Mayor Roger Randle's assistant Susan Savage, and independent consultant and member of the U.S. Clean Air Act Advisory Committee Ben Henneke; all of whom had worked together in the past (Henneke 1999). The mission of the Air Quality Committee was to develop a voluntary program which would allow the city to remain in compliance with the NAAQS for ozone (Pinc and Lasker 1998).

Concurrent with INCOG's efforts, the Tulsa City-County Health Department was also taking a proactive stance on ozone. Its efforts began by sending letters to the County Commissioner's and Mayor's office, asking for their help in encouraging behavioral changes by the citizens of Tulsa (Anonymous 6/28/1991; Everly-Douze 6/28/1991). They also began an early public awareness campaign, publishing several steps to help reduce ozone levels in the local newspaper, including limiting the number of days a given vehicle could be driven (Anonymous 7/1/1991). Along with the letters to public officials, the City-County Health Department also sent a letter to INCOG outlining specifics of Tulsa's ozone problem and offering 35 suggested behavioral changes the citizens could make (Caldwell 1991).

The Air Quality Committee and the City-County Health Department soon began to work together to develop a program. The goal was to avoid any further exceedances of the ozone standard in 1991. In order to do so, they had to have a program up and running quickly (Henneke 1999). It was felt that, in order to be effective, the program should contain at most three or four main message points which would be carried to the general public (Henneke 1999). The data which the City-County Health Department had available to them at that time indicated that ozone formation was hydrocarbon (particularly volatile organic compounds, or VOC's) limited. Data also indicated that approximately 70% of VOC emissions were from mobile sources (Bishop and Van Sandt 1991). The program's efforts were, therefore, focused on limiting hydrocarbon emissions, particularly from mobile sources.

The resulting program was a composite of *temporary* behavioral changes that Tulsa citizens could make on a *voluntary* basis as the need arose. Both the voluntary and temporary nature of these changes were key to the success of the program.

> "We came to the conclusion early on, when we started this program, that we were not apt to change lifestyles on a total basis. What we would try to do is try to get people to do things on those particular days that it really meant something. ... You

> know, you do this tomorrow, and then you don't have to do it for another week or two, and then we may ask you to do it again. We thought that wasn't asking too much (JL)" (Pinc and Lasker 1998).

The success of a voluntary, episodic program required the coordination and cooperation of several agencies and businesses. During the Air Quality Committee meetings, the City-County Health Department had agreed to work with the National Weather Service to develop a method of predicting the potential occurrence of high ozone days (Ozone Alert! days) (Everly-Douze 7/24/1991). This was something which had never before been done successfully (Bishop 1999). Tulsa Transit agreed to provide free bus rides on Ozone Alert! days (Ryan 7/24/1991). The Tulsa Chamber of Commerce agreed to provide a list of businesses which could be contacted the day before Ozone Alert! days to inform their employees of measures which employees should take to avoid high ozone levels (Pinc and Lasker 1998). Finally, some of the local refineries agreed to voluntarily reduce the Reid vapor pressure (RVP) of the gasoline they were supplying to the Tulsa area from 9.5 to 8.5 psi (Everly-Douze 7/25/1991; Pinc and Lasker 1998).

The program was deemed to be successful, winning praise from the EPA almost immediately (Everly-Douze 7/27/1991). In its first year the program contained the following key components: 1) encouraging citizen's to take advantage of free bus rides or to carpool if buses were not available; 2) reduction of RVP in local gasoline; 3) development and refinement of Ozone Alert! prediction capabilities, and; 4) massive public relations campaign (over 70 newspaper articles promoting the program appeared between June 1 and October 1 of this year). In addition to these major components, several other programs were initiated on a trial basis during the first summer. These included free emissions testing (Everly-Douze 8/24/91) and discount repairs for emission systems (Anonymous 8/27/91).

After meeting with success the first year, the program was continued (and still continues) in the following years. At the end of each ozone season (May 1 - September 30) the program is evaluated to determine what did and did not work particularly well (Anonymous 10/31/1991; Pinc and Lasker 1998). Participants are then given the opportunity to make suggestions regarding program changes to be implemented the following year. One of the most innovative changes made during the 1992 ozone season was the MERIT trading program discussed below.

2.2 The MERIT Program

At the beginning of the 1992 ozone season, INCOG began negotiations with the EPA to implement a pollution-reduction emissions trading program (Everly-Douze 5/14/1992). The program, the Maximum Emissions Reduction by Intersource Trading (MERIT), is aimed at encouraging actions which reduce emissions from mobile sources and providing credits to stationary sources for those actions.

Developed by a multi-stakeholder group which included representatives from environmental groups, local and federal governments, as well as industry, the program was initiated as a three-year pilot program (Everly-Douze 7/12/1992). It allowed both industries and individuals to earn saleable credits for voluntarily reducing the emissions they created. In addition, since only 90 percent of a given credit could be sold, the program would have an overall effect of continuously reducing local air pollution (Everly-Douze 7/12/1992).

While created in Tulsa, the MERIT program was never implemented there (Lasker and Pinc 1998). It was thought that the other voluntary measures which industry was already taking were working well enough that an emissions trading program was not needed (Lasker and Pinc 1998). However, the program went on to serve as a model emissions trading program for the EPA, which adopted much of the innovations developed as part of the program in their open market trading system (Henneke 1999). It has, however, been successfully implemented in other areas of the country (Maurer 8/30/1996).

2.3 Further Improvements to the Ozone Alert Program

While the Ozone Alert! program continued to win awards (see for example Anonymous 3/24/1993), the entrepreneurs continued to make changes in the program with each ozone season. In 1993, for example, Tulsan's were urged to refrain from mowing their lawns on Ozone Alert! days, and green "Thumbs up" posters were provided to gas stations selling low RVP fuel. In addition, a federal transportation grant was secured which enabled INCOG to purchase a mobile automobile emissions testing lab (Everly-Douze 6/19/1993). This lab was then made available to the employers and the general public to test their vehicles.

New program implementations in 1994 included a contest to create a slogan and logo for the Ozone Alert! program (Anonymous 2/8/1994). In addition, exceedances of the ozone standard on two consecutive days in June prompted the Air Quality committee to ask the business community to take additional measures such as offering flextime (Holland II 6/24/1994). In July of that year, a third gasoline supplier agreed to voluntarily reduce the RVP of the gas it supplied to the Tulsa market. Meanwhile, the other two suppliers reduced their RVP to even lower levels (Everly-Douze 7/8/94). These incidents also prompted a visit to the EPA Region 6 offices in Dallas by a delegation of Tulsa officials and congressional members (Everly-Douze 7/16/94). At this meeting, the delegation asked for both technical assistance and some kind of credit for the voluntary efforts the city had taken to keep its ozone levels below regulatory limits. This meeting, in addition to addressing some of Tulsa's immediate needs, also served to open the door with the EPA for the Flexible Attainment Region (FAR) agreement which was signed in late 1995.

2.4 The FAR Agreement

The FAR agreement is the result of efforts by Tulsa officials to encourage the EPA to enter into a "demonstration project" whereby the city could avoid being placed on the agency's ozone non-attainment list (Anonymous 7/30/1995). The goal of the project was to allow Tulsa to tailor an individual strategy for reducing ozone levels instead of adopting a nationally mandated program (Travis et al. 1996). On August 22, 1995, Tulsa was the first city in the nation to receive designation as a flexible attainment region by the EPA.

The FAR agreement, which is to remain in effect for 5 years, includes the following key provisions (City of Tulsa 1995):

1) Continuation and expansion of the Ozone Alert! program

2) Development of Real Environmental Strategies for Partners in Ozone Negation Systems (RESPONSE) measures, including revisions to the State Implementation Plan (SIP)

3) Creation of the Tulsa Ozone Prevention Strategy (TOPS) to study ozone formation processes in the Tulsa area

The RESPONSE measures are a list of actions which the city and INCOG agreed to implement in the event an exceedance of the ozone standard occurs. The list was prioritized such that the first exceedance triggers the implementation of the first RESPONSE action, the second exceedance the second action and so forth. The agreement also allows for the concurrent implementation of more than one measure in order to take advantage of potentially synergistic effects (City of Tulsa 1995). These measures include, in order of priority: 1) creating a "smoking vehicle hotline"; 2) conducting public "car care clinics"; 3) implementing a "Clean Fuels Fleets" program; 4) expanding "Employee Commute Options Awareness' programs for local businesses, and; 5) creating an "Ozone Information Hotline" (Turner 1997).

In addition to the RESPONSE measures, SIP RESPONSE measures were also developed. These measures are quantifiable and enforceable and require revisions to Oklahoma's SIP (Travis et al. 1996). Once the EPA has determined that Tulsa has experienced a violation of the ozone NAAQS, implementation of SIP RESPONSE measures will begin immediately. The agreement then allows the measures "adequate opportunity to work before issuing a 'SIP Call' or redesignating Tulsa as a non-attainment area" (City of Tulsa 1995).

It was further agreed that the first two SIP RESPONSE measures would be implemented, whether or not a violation occurred, as soon as possible following the signing of the FAR agreement. These were the initiation of a SIP revision mandating a maximum RVP of 8.2 psi and the introduction of legislation to include a vehicle fuel system pressure test. The required legislation for both of these programs has passed and they are to be put into place as soon as possible following the determination by the EPA that a violation of the ozone NAAQS has occurred.

The TOPS program is intended to study the effectiveness of the FAR control methods, as well as more accurately identify the sources of ozone in the Tulsa metropolitan area. Actions included in this portion of the FAR agreement include: 1) revision and expansion of the emissions inventory; 2) create a more accurate model to predict the probability of exceeding the NAAQS, and; 3) evaluate the contribution of precursors transported from outside the airshed to ozone levels within Tulsa's airshed. These efforts remain under way at the current time (Turner 1997).

Tulsa's innovative approach at remaining in attainment for ozone has continued to grow over the past decade. The Ozone Alert! program fax notification currently includes over 450 businesses and companies (Espinosa 5/12/1999). The city has garnered much recognition and numerous awards for their approach, which has served as a model for many other municipalities (Turner 1997). Given the current state of uncertainty surrounding the ozone NAAQS, it is unclear what additional actions the city will need to take to remain its attainment status (Myers 10/22/1999). However, the ozone issue remains a priority with the current administration (Kitz 1999).

3 Key Innovations

This section will review the key innovations identified through the examination of Tulsa's Ozone Alert! case. The review will focus on the strategies employed by the policy entrepreneurs which led to the specific innovations. Consideration will also be given to the role played by scientific/technical information (STI) in advancing the innovations.

3.1 Ozone Alert!

The first key innovation in the Ozone Alert! case study is the development of the Ozone Alert! program itself. Both the political and technical success of this program helped the policy entrepreneurs garner the cooperation of key EPA officials in negotiating the FAR agreement. Several unique innovations can be found within the broad category of innovation which became the Ozone Alert! program. The first of these is the formation of the INCOG Air Quality Task Force.

This task force was initially formed in order to expedite the removal of Tulsa from the non-attainment list before the signing of the 1990 CAAA.

> "The mission of that Air Quality Task Force at that time was to go to our congressional delegation and press them into getting EPA to take us off, to recognize our three years' worth of clean data, and take us off the non-attainment list before the new act was signed (JL)" (Pinc and Lasker 1998).

According to documentation made available by INCOG, three main issues were blocking Tulsa's attainment redesignation: 1) redesignation is not made until the city meets both the technical (monitoring data show compliance) and administrative requirements (i.e. an approved SIP); 2) questionable methods of interpolating ozone levels during EPA mandated monitor downtime, and; 3) administrative requirements should be reflective of the specific pollution problems in each city to the maximum extent possible (INCOG 1989). The task force was successful in its mission, with Tulsa being officially removed from the non-attainment list on October 30, 1990 (Associated Press 11/1/1990), prior to the enactment of the CAAA on November 17, 1990.

The successful redesignation of Tulsa prior to the enactment of the 1990 CAAA, clearly shows the entrepreneurs engaged in strategic activities. Considering that the

Ozone Alert! program began by reinstating this committee following the 1991 exceedance, it is no surprise that the entrepreneurs again acted in a strategic manner. "Strategy is a big part of forming that policy. I say that and it was for the FAR also (GP)" (Pinc and Lasker 1998).

In their interviews, many entrepreneurs discussed specifics of the strategy which was followed. The strategy can be summarized as follows: 1) keep the program simple; 2) build upon small successes; 3) forge partnerships; 4) make continual improvements, and; 5) educate.

3.1.1 Simplicity

Simplicity was required both due to the speed with which the program was initiated, and to keep public participation levels high (Selph 1999).

> "Our goal was to have it out the door in only a few [more] days. In other words, we were very much focused on not having the monitors go off again. And yet, at the same time, we wanted to have a program that would be kind of robust and popular. You know, that people would understand. So we ended up deciding that we would only have three or a maximum of four message points" (Henneke 1999).

The entrepreneurs also knew that they would not be able to fashion a program which was perfect from a regulatory standpoint (Henneke 1999). But, they did want the public to make voluntary changes which would have a positive impact on Tulsa's ozone levels. "That's what we look at, is what's feasible. What can we get people to buy into on a voluntary basis without forcing it on them?" (Selph 1999). The decision to focus on reducing hydrocarbon emissions from mobile sources is just one example of this strategy. By focusing on actions with a high probability of success, the entrepreneurs were able to very quickly deem the program a success. They could then build upon their success, by garnering further media attention.

3.1.2 Building upon Success

This strategy was particularly important in helping to overcome one of the initial obstacles they faced, prediction of ozone. When he was first approached to develop a prediction model, Ray Bishop's response was "Well, that's something that has been tried in a lot of places. It's never worked before" (Bishop 1999). This sentiment was echoed by many of the partners involved, including the National Weather Service. The particular concern was what to do if a high ozone day was predicted, and one did not occur (Pinc and Lasker 1998). According to Eddie Terrill, Oklahoma Department of Environmental Quality (DEQ) Air Quality Division Director, "It was as if you called one and didn't go over, you didn't know what you were doing. You made a mistake doing it. And getting over that was a problem and something we were conscious of" (Terrill 1999). The answer to this dilemma involves the strategy of building upon successes, you simply declare the program a success. "Every time we call one and then we don't have an ozone exceedance, let's claim that that's because of all the brilliant things that the citizens did" (Henneke 1999).

3.1.3 Successful Partnerships

The realization by state and federal government officials that they would not be held out as scapegoats should they incorrectly predict high ozone levels was key to their joining the partnership (Pinc and Lasker 1998). The partners involved in this program consist of public officials (at all levels of government), private corporations (such as the refineries and distributors), environmental and health advocates, and the media (Pinc and

Lasker 1998). "So bringing everybody to the table was the key element of getting buy-in and also of exchange of ideas of where we could get reductions (GP)" (Pinc and Lasker 1998).

While the health effects of ozone have been documented, the entrepreneurs emphasized the costs of non-attainment in their efforts at motivating partnerships. "I think people are much more willing to listen and to absorb that message if in fact they realize that not only is this a public health problem, but it's going to affect their pocketbook" (Selph 1999). While discussing the nature of the partnership, Gaylon Pinc, Manager of Environmental Engineering Services at INCOG commented,

> "And that's been the key, that we all have the common goal of staying in attainment for whatever motive that we have to stay in attainment. That we all want to do that. Some is for health. Some is for cost. Some is for inconvenience. But having that common goal puts our mind toward creating work on how we do that (GP)" (Pinc and Lasker 1998).

One strategy which the entrepreneurs employed to get industry actively involved was, instead of telling them

> "This is what we want you to do", asking them what they *could* do. "We got all the players around the table and said, 'Okay. You tell us what you're going to do in your particular area to bring about some reduction [in hydrocarbons]. No matter how small, you tell us what you can do (JL)" (Pinc and Lasker 1998).

A key component in getting the refineries to reduce the RVP of gasoline was the personal relationship which already existed between Ben Henneke and Sun personnel.

> "The chief operating officer (CEO), he is now CEO, of Sun was on the U.S. Alternative Fuels Council with me and also on the Clean Air Act's Advisory Committee which had just recently been appointed. ... So I called [him] up as soon as we had that first alert and talked to him" (Henneke 1999).

The effort put forth by Sun (reducing RVP) was critical, especially given the significant financial burden the company would bear (approximately $500,0000 the first year).

> "When I told him how much it was going to cost, he took a deep breath because Sun was not particularly profitable at that moment, and he said, 'Well, it's the right thing to do. Let's do it.' So at a very crucial moment, having a very senior executive of an employer and a refiner that produced a product for Tulsa and somebody with real stature nationally, stepped forward and spent corporate funds, took a risk that the corporation would be damaged by doing the right thing environmentally" (Henneke 1999).

When Sun agreed to produce lowered RVP fuel for the Tulsa area, the entrepreneurs were then able to use that as leverage with the other producers to garner commitments (Henneke 1999).

Many of the entrepreneurs emphasized that the attitude of the Sun executive is reflective of the overall community in Tulsa. According to former Tulsa mayor Rodger Randle, this community spirit results from Tulsa initial leaders' attitude that social standing was related to what you did for the community. "We have a great tradition in Tulsa of people having a sense of community responsibility. ... We are beneficiaries of the history of a sense of community identity and mutual obligation among all of us as citizens" (Randle 2000). According to Randle, this sense of duty toward the community also extended to those professionals who become civil servants in Tulsa (Randle 2000). Dr. William Potter, environmental chemist at The University of Tulsa, commented that this attitude is particularly evident in the mayor and her staff (Potter 1999).

This attitude appears to be just as prominent in Tulsa's business community. Comments such as "we traditionally have had a very positive and constructive business community" (Randle 2000) and "Tulsa's business community is so enlightened from the standpoint of where 'we're willing to do whatever needs to be done to make Tulsa a better city. And that's a pretty broad perspective" (Cole 1999) were heard frequently during the interview process. The Chamber of Commerce's assistance in setting up the fax notification procedure was particularly important. They sent out a solicitation to their members, asking them to endorse the Ozone Alert! program by informing their employees the day before predicted Ozone Alert! days (Henneke 1999). "And that's been one of the keys to our success is the business sector has been good to support this and have developed some neat little strategies every year" (Selph 1999).

Another key partner in this effort was the public. The Ozone Alert! program is deliberately voluntary and episodic.

> "We came to the conclusion early on, when we started this program, that we were not apt to change lifestyles on a total basis. "The city and INCOG felt like there was a need to put a program together that was episodic and voluntary in order to stay in attainment. ... If you can do that in a way that is purely voluntary and do things ahead of the curve, then it's less expensive and you might come up with some ideas that hadn't been thought of before" (Terrill 1999).

Such a voluntary, episodic program would have no chance of working without the public's involvement. Obtaining the public's buy-in on the program was a major obstacle in the success of the program. "The bigger problem was getting the buy-in of citizens. And it wasn't the fact that they didn't want to, it's a matter of education. We've got to let them know what they do does make a difference" (Terrill 1999). This sentiment was echoed by other entrepreneurs, "The most important thing was convincing the general public that if they did something that it made a difference. That was the biggest problem we had (JL)" (Pinc and Lasker 1998). The episodic nature of the program also helped to gain the public's participation. Had they been asked to make permanent lifestyles changes, a voluntary program would have had less chance of success. "It only happened occasionally. If we'd have had 50 Ozone Alerts! in a summer, the program wouldn't have worked" (Henneke 1999).

Several strategies were followed in order to gain the much needed public buy-in. One approach which helped was the use of industry partners to educate their employees.

> "That probably had as much to do with it as anything because if you can get a few of the key industries to change their work schedules or the time they bring people to work, it can make a big difference on your private patterns and things like that" (Terrill 1999).

Another key component of the strategy to win the public's buy-in was the media.

> "They made a point of getting something on the news every Ozone Alert! day and many days in between. The public got the story. ... it was something that, and I don't know whether it's unique to the city of Tulsa and the people there or not, but they picked up on it. They liked the idea that there was something they could do to control their destiny" (Bishop 1999).

The media was especially helpful in preventing the public from becoming too blase about the Ozone Alert! program, especially after the program had been in place for several years (Terrill 1999).

> "It's difficult to keep people's motivation level up. And that's a struggle we've had, and we knew that we were going to have .... and you do your best to work with the members of the media as well as the press, the printed press to keep that message out there in front of them. That: 'Gosh, folks, this is really important. This is a critical issue for Tulsa. And we know you are getting tired of it. We are too'" (Selph 1999).

3.1.4 Continuous Program Improvements

During the first year of the Ozone Alert! program, the entrepreneurs focused on only a few key components aimed at reducing hydrocarbon emissions from mobile sources (primarily automobiles). "So knowing that mobile source was the major hydrocarbon emitter, that was the area that was attacked first" (Bishop 1999). However, another component of the overall strategy has been an effort to continuously improve the program every year.

> "We continue to try to improve upon the program each year, to look at it at the end of the ozone season to determine what worked, what didn't work, what can we do better next year and so on. And then begin, at that point, the planning process for next year's program. We don't wait until two weeks before the beginning of ozone season to say "Oh gee. What are we going to do this year?'" (Selph 1999).

The program improvements can be placed into two generalized categories: 1) those aimed at improving the modeling efforts, and; 2) direct program improvements.

As discussed earlier, at the beginning of the program many of the key partners expressed a hesitance to predict Ozone Alert! days. The success of the program, therefore, required the development of some kind of predictive capability (Terrill 1999). Efforts which had previously been made elsewhere had met with little success (Bishop 1999). Tulsa's predictive modeling efforts have focused on correlating historical meteorological and ozone data (Pinc and Lasker 1998; Jeffries 1999). Factors which have been found to be important are temperature, wind speed, cloud cover, frontal passages, and time of day (Jeffries 1999; Bishop 1999). Development of the model required the integration of much STI from various sources. The strategy followed for accessing the STI was to look in the scientific literature, attend conferences (such as the Air and Waste Management Association (AWMA) and State and Territorial Air Program Administrators/Association of Local Air and Pollution Control Organization (STAP/ALAPCO), and to make telephone calls (Bishop 1999). Additional information and assistance was obtained from the National Weather Service (NWS) in Tulsa. The DEQ and NWS personnel have formed a unique partnership, working together to solve Tulsa's ozone problem.

After the program had been in operation for a few years, Dr. William Potter, a professor of chemistry at the University of Tulsa became interested in connecting Oklahoma MESONET data with environmental pollution in Tulsa. In recent years, Dr. Potter has been working on a model which is not based upon the statistics of historical data, but upon real-time meteorological and ambient air monitor measurements. "I had some interest in seeing how far the technology could go in terms of determining what was in the air and then how to model what was in the air" (Potter 1999). His model uses sophisticated interpolation techniques to "predict" the ambient ozone concentrations around the Tulsa metropolitan area, based upon near real-time data from monitors. One of the promising interpolation techniques which he has investigated is the use of neural networks, which can be trained using historical data. Currently, the results of Dr. Potter's model are supplied to the Tulsa DEQ office and are utilized as a secondary source of information in determining whether or not an Ozone Alert! day is called (Jeffries 1999).

The second general category of improvements are those directly affecting the Ozone Alert! program. Some of these are a result of suggestions from partners, however many result from an increased understanding of and accessability of STI. One improvement which is directly based on STI is the "Slow Down and Sweat" program implemented recently. In this program, motorists are requested to obey the speed limits and not use their automobile air conditioners on the morning commute. Recent updates to Tulsa's emissions inventory suggest that ozone formation may not be hydrocarbon limited, but may be NO_x limited (Pinc and Lasker 1998). A study conducted by one of the industry partners indicated that air conditioning use increased the operating temperature of catalytic converters, thereby converting more nitrogen to NO_x (Pinc and Lasker 1998). INCOG also estimates significant NO_x reductions if motorists reduce their rate of speed (Pinc and Lasker 1998).

Another program improvement based upon increased STI is the request that people not mow their lawns or use other small gasoline powered equipment on Ozone Alert! days. This program modification was based upon scientific evidence that small motors were major contributors of ozone precursors (Pinc and Lasker 1998; Selph 1999). This improvement was quite successful.

> "We came up with the idea about not mowing your lawn on our own. But that was a very major technology breakthrough. Because of all the messages you can get across to kind of capture the Ozone Alert! program, saying, "It's hot as hell, and the ozone's going to be bad. So tell whoever is telling you to mow the lawn, including your own conscience, 'Gosh, I don't want to do that. It's an Ozone Alert! day. I think I'll go have a beer and lie in the hammock instead.'" And that really . . . that captured people's imagination in ways that 'filling up after sunset' never had quite captured it." (Henneke 1999).

Examples of program improvements which were not specifically based on STI were the smoking vehicle hotline, the improved coordination of downtown Tulsa traffic lights, and discounted tune-up offers. The smoking vehicle hotline consists of a toll-free number which the general public can call to report vehicles with excessive emissions. The vehicle owner is then sent a notification of the observation along with advice about vehicle repair and maintenance (Turner 1997). This program is purely voluntary, and no punitive action results from the reports.

The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 (PL 102-240) made Congestion Mitigation/Air Quality (CMAQ) funds available to all states. The CMAQ funding program directs monies to transportation programs and projects which will help to achieve NAAQS. Funds are apportioned based upon population of non-attainment areas; however, states which contain no non-attainment areas are guaranteed a minimum allocation. The entrepreneurs active in this case successfully garnered some of Oklahoma's CMAQ funding to improve the Ozone Alert! program. ISTEA funds have also been used to upgrade the downtown Tulsa traffic signal system to reduce idling time, to subsidize free bus rides on Ozone Alert! days (federal regulations limit free bus ride funding to two years, however), and to purchase portable message boards to inform the public of Ozone Alert! days (Pinc and Lasker 1998). The entrepreneurs were also successful in securing money from the State Department of Transportation to fund a remote sensing program which identified gross emitters (Pinc and Lasker 1998). The owners of the vehicles were then given an opportunity to obtain reduced cost tune-ups.

Funding such as that mentioned above is not easy to obtain. It requires that changes be made in the institutional environment, particularly at the Federal level.

> "The whole public policy on this whole area is, the federal government will put some money into areas that are bad [i.e. non-attainment areas]. They don't put money into areas that are good. The only way to get money is to be bad. We are trying to convince them that an ounce of prevention is worth a pound of cure (JL)" (Pinc and Lasker 1998)

The institutional environment was not only a barrier to obtaining funding, it also was a barrier (especially early on) to program acceptance.

> "There was no regulatory support at all, even at Oklahoma DEQ levels and certainly none at EPA. In fact, they would say, 'Well those reductions don't really count because they are episodic, and we don't do episodic reductions'. They were just learning at EPA to think about seasonal reductions instead of annual reductions. And so the idea of doing something on an episode was totally foreign to them" (Henneke 1999).

This problem was particularly prevalent when the EPA began offering credits for early action and did not offer credits for voluntary programs (Bishop 1999). To a certain extent, the local institutional environment, particularly that of the communities which surround Tulsa, had to be changed as well. "There were other people that didn't want anything to affect the surrounding communities because it was a Tulsa problem, and they didn't really think they had anything to do with it" (Bishop 1999). The relationship between Tulsa and its surrounding communities was partially responsible for the belief that Stage Two vapor recovery was not a viable option (Bishop 1999).

3.1.5 Education

As discussed previously, public education played a key role in the success of the Ozone Alert! program. One component of the general public which the entrepreneurs feel is particularly important are children. "I really try to involve kids. We all try to educate them as to the benefits of improved air quality. ... If they do nothing else but make their parents think a little bit, then that's what we're after" (Selph 1999). The local officials, industry representatives, and entrepreneurs also benefit from the educational opportunities present in the program. "We are able to cross-educate one another about what motivates us, and what's important, and what we ought to do (GP)" (Pinc and Lasker 1998). One strategy which has been particularly useful in educating the elected officials has been to take advantage of their regular meetings to discuss the issue of air quality with them (Selph 1999). The net result of the education efforts has been remarkable. "I would say that through these efforts that we probably have the best educated community on ozone and what to do to reduce emissions of any area in the country (JL)" (Pinc and Lasker 1998).

3.2 The FAR Agreement

The FAR agreement grew out of Tulsa's success with the Ozone Alert! program. Many of the personal relationships which were a key to its success resulted from interactions initiated during the development of the Ozone Alert! program (Henneke 1999). Particularly important was the personal relationship Ben Henneke fostered between Mary Nichols at the EPA and Mayor Susan Savage. It also required overcoming the institutional barriers discussed above.

> "I think it's very interesting that the FAR and everything that has happened after basically was generated from a 'We want to do it. We can do it better our way, and we will find a way to do that. And we will make it happen quickly' attitude. And through public and private partnerships, again, we have been able to do that. But there are a lot of little quirks along the way, and breaking down of paradigms, changing those anyway (GP)" (Pinc and Lasker 1998)

Much of the success of the FAR can also be attributed to a change in attitude in the early 1990's as the federal government began to reinvent itself (Henneke 1999). "EPA was in need of showing Congress that they were working with the local programs" (Terrill 1999). Part of the entrepreneur's strategy was to take advantage of this change in the prevailing paradigm and gain acceptance of the FAR.

> "So we caught EPA at a time that they were ..., and this played into part of the strategy in developing the FAR, 'Okay we have EPA under the gun to be more cooperative and to be more friendly to people in general. We can offer them something that will do the same thing as their regulations would do, and we'll do it voluntarily, but we'll do it our way. Things that work here. Things that we know won't work here, we won't propose to do (GP)" (Pinc and Lasker 1998).

Another strategic effort on the part of the entrepreneurs was to secure signatures from ten different agency representatives. "The goal became to try to have as many people west of the Mississippi sign the FAR as humanly possible. Because we figured if we had 400 pages of signatures, it didn't matter what it actually said. It would have some political substance" (Henneke 1999). By garnering many signatures, the entrepreneurs affirmed the regional buy-in of the program and it's fundamental posture of flexibility. Since the passage of the FAR agreement, many of the RESPONSE measures have been implemented following exceedances.

The entrepreneurs hope that these good faith efforts on their part will allow them some flexibility as the EPA reviews its proposed new ozone standard (Pinc and Lasker 1998). In July of 1997, EPA issued revised NAAQS for ozone and particulate matter. The 1997 ozone rules proposed replacing the 1-hour, 0.124 ppm standard with an 8-hour average 0.08 standard. An area's compliance with the new standard is calculated "by the 3-year average of the annual fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within the area" (64 Fed. Reg. 57,424). The new rule was soon challenged in court, however, and a decision is still pending. On May 22, 2000 the U. S. Supreme Court agreed to hear the case, a decision is expected sometime in 2001. In the meantime, the EPA is enforcing the old standard.

Since the signing of the FAR agreement, Tulsa has become a partner with the U. S. Department of Energy (DOE) in its "Clean Cities" program. Clean Cities is a program designed to encourage the use of alternative fuel vehicles (AFV's). The program takes a voluntary approach toward encouraging AFV use and integrating them into the local planning process. "The Clean Cities program thrives on strong local initiatives and a flexible approach to the challenge of building alternative fuel markets, providing participants with options to address these problems" (U. S. Dept. of Energy 2000). Given Tulsa's previous experience with such voluntary, regional programs, it is not surprising they have joined this program. Only in existence since June, 1996, Tulsa's Clean Cities program has already garnered praise from DOE as an "alternative fuel success story". With grants from the Oklahoma Department of Commerce, the DOE, and through a partnership with Oklahoma Natural Gas, Tulsa Public Schools have converted over 170 busses to compressed natural gas. The savings it garners in fuel costs allows the school district to repay the loans.

4 Summary

In contrast to the previous two cases which were responses to actual threats, the Ozone Alert! case represented a response to a *perceived* threat for Tulsa. The threat is characterized as perceived because Tulsa was under no obligation to the EPA to reduce their ozone levels and while the community knew that redesignation would have impacts, these impacts were uncertain.

> "The non-attainment designation has two major impacts on a city. One is that you actually have to do things under the Clean Air Act including stuff like offsets and other controls. But second, it really makes you a less attractive economic development location because people moving in have to go through a very different permitting process" (Henneke 1999)

In this case, the mere threat that Tulsa would lose any competitive advantage it might have was enough to spur action (Pinc and Lasker 1998; Selph 1999). It is this threat of the "federal hammer" as opposed to the threats to public health which has captured and held the public's attention.

There are several aspects of the Ozone Alert! program which are key to its success. First off is that it is voluntary and Tulsa's air is relatively clean. "If you had been in an area that was very much in non-attainment or never had come into attainment, I don't think this would have flown because you can't do that many things on a voluntary basis to get yourself back into compliance" (Terrill 1999). The voluntary, episodic nature of this program is similar to the flood warning program developed in the Mingo Creek case. In both cases, the citizens are being *asked* to change their behavior, but only on a *temporary* basis. These cases clearly show Tulsa's willingness to make short-term lifestyle adjustments, however, it is less clear whether the city is ready to make the longer term adjustments which sustainability requires.

A second key to the success of the program are the successful partnerships which have been developed. "Everybody talks about public-private relationships, and to a degree it's semantics in a lot of areas, but let me tell you, in Tulsa it is the reality. The public sector and the private sector get together and they make things happen. And it's a very unusual situation" (Cole 1999). Part of the reason why buy-in was readily achieved in this case is the compliance driven nature of the crisis. Had businesses and individuals not had a personal stake in keeping Tulsa's air clean, this buy-in might not have been achieved (Selph 1999). The wish of the partners to retain their autonomy and flexibility also appears to have played a role in their buy-in. This is not surprising, as recent research has demonstrated a parallel situation occurring with private sector innovation (Ellington et al. 2000).

The final keys to success identified during the case study are the involvement of all levels of government, the timely incorporation of STI, and a systems approach. "It's important for a program like this to be successful, for it to work at all levels. I cannot be just INCOG implementing this program. It needs support from the elected officials as well" (Selph 1999). As in the Mingo Creek case, the intellectual contributions have mainly come from state and federal regulatory agencies. The inclusion of these other agencies as key partners has served the entrepreneurs well by opening doors which may have otherwise have remained closed (Henneke 1999). A prime example of this is the development of the FAR agreement which builds upon the success and recognition of the Ozone Alert! program.

As in the previous two cases, the city's technical capacity was limited. In this case, one limiting factor was the difficulties associated with quantifying emissions and emission reductions from mobile sources (Pinc and Lasker 1998; Terrill 1999). STI was used not only to advance the modeling efforts, but also in determining the types of program changes to be implemented.

Approaching the problem from a systems point of view was mentioned as key by several of the entrepreneurs (Potter 1999; Pinc and Lasker 1998; Terrill 1999). As uncertainty regarding the nature of Tulsa's ozone problem continues to decrease, the specificity of the source of Tulsa's ozone continues to increase. Recent data suggests that a portion of the ozone measured at Tulsa's monitoring stations may result from long-range transport from Texas (Owen 6/4/2000). If this source proves to be significant, effective response will require a regional effort. Tulsa's history of successful partnership building will go a long way toward helping it to successfully negotiate regional solutions.

The entrepreneurs active in this case acted in a strategic manner. The circumstances they found themselves in required strategic action. Not only were there barriers present in the institutional environment which had to be overcome, but there were financial barriers as well. "The non-attainment areas are getting millions of dollars in CMAQ funds to do these programs. We're doing it on transportation funds (JL)" (Pinc and Lasker 1998). Another factor which Tulsa had to somewhat overcome was its own prevailing attitude local initiatives were the only solution (Cox 1999). "Tulsa has always viewed itself as: Oklahoma City has gets most of the things from an economic development standpoint because the legislature is over there. ... And so they feel like they have to do things for themselves more so than rely on state government" (Terrill 1999). The reality of the political and financial situation Tulsa found itself in cultured an awareness of the limited number of opportunities it would have to change the situation. This awareness, in turn, helped the entrepreneurs to recognize windows of opportunity and act upon them.

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Chapter 6

Decision-Making Schematic

1 Introduction

Four idealized representations of the policy innovation process can be generalized from the literature review in Chapter 2: (1) trial-and-error (groping along); (2) controlled experimentation (adaptive management); (3) entrepreneurial-led learning, and; (4) paradigm shift. The trial-and-error, or groping along, model was proposed to describe strategies where little thought is given at the outset to the relationships between outcomes of specific policy decisions and explicit policy goals (Lindblom 1959; Etzioni 1967; Behn 1988; Golden 1990; Sanger and Levin 1992). An idealized version of groping along is shown in Figure 2. In this case, the decision-maker, presented with a problem, randomly chooses a solution from the set of known solutions. No prior planning for optimal decision-making is undertaken. In addition, no examination of solutions other than those which are known to have worked in the past is made. The chosen solution undergoes continual refinement only after it is placed within the confines of its operating environment, providing feedback into the set of possible solutions. (This feedback is shown in Figure 2 as the no loop). While some evidence exists supporting trial-and-error, the nature of environmental problems is such that much more thought must be given to potential solutions at the outset than allowed for in this particular representation.

Controlled experimentation (or adaptive management) is better suited to environmental problems (Etheredge 1981; Lee 1993; Holling 1995). This process is

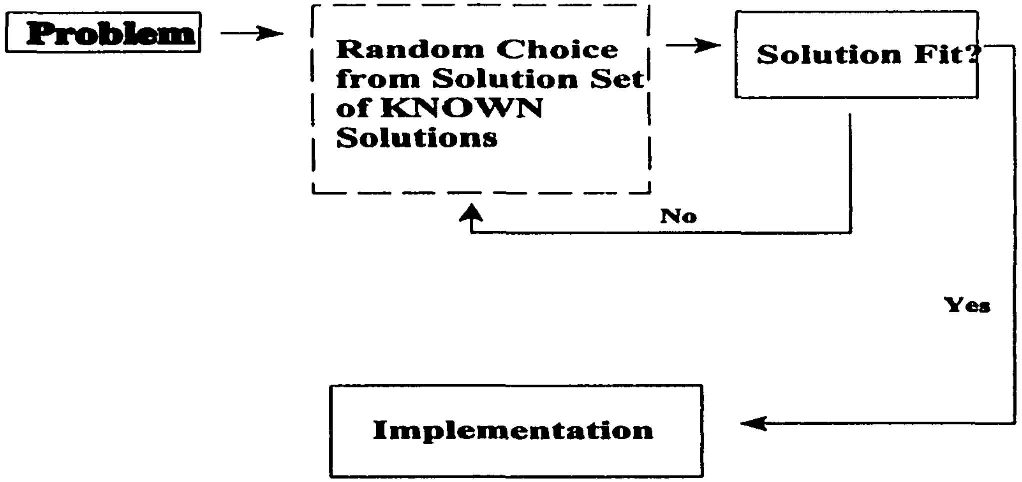

Figure 2. Idealized Representation of Innovation by Groping Along

presented (in idealized form) in Figure 3. Controlled experimentation differs from trial-and-error in that a solution is not chosen at random, but is chosen after analysis of external information. In addition, the individual performing controlled experimentation has a commitment to learning and making mid-course corrections, whereas in trial-and-error, no such commitment exists. The learning is shown in the form of feedback loops (dashed lines) in Figure 3. Information which is used to guide the choice of solution can take the form of environmental data, general knowledge regarding the particular problem, and/or individual expertise. In this case, the information is used to eliminate some of the known solutions and introduce "theoretical solutions" into the potential solution set. "Theoretical solutions" are those which scientific and technical information (STI) shows to be favorable, but which have never been implemented in practice. Information is also used to determine the probable system response to the implementation of any particular solution. Feedback obtained after implementation then serves not only to further refine the set of potential solutions, but also to enlarge the body of STI used to guide decision-making.

In theory, such a holistic model seems ideal because policy decisions are viewed as experimental, open to ongoing evaluation and refinement. However, in practice, it is very difficult (if not impossible) to construct valid environmental policy experiments (Parson and Clark 1995). Part of the difficulty lies in the fact that establishing valid controls is nearly impossible. Another obstacle to constructing valid environmental policy experiments is the inherent variability of the natural system, and lack of scientific certainty on how to interpret such variability. The costs (political, economic, and social)

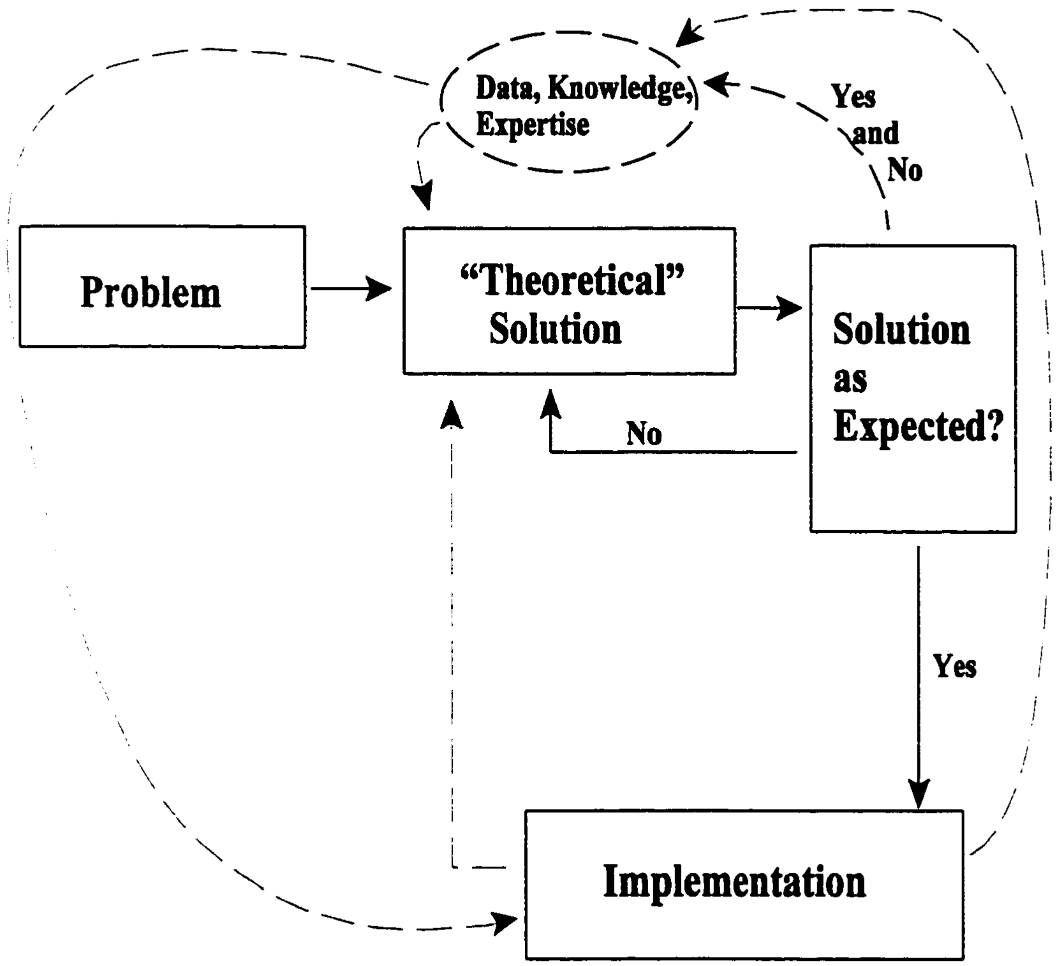

Figure 3. Idealized Representation of Adaptive Management/Controlled Experimentation

associated with doing true policy experiments are also prohibitive. Finally, it is rare that a municipality has on staff the expertise necessary to do the analysis and interpret the results of environmental policy experiments.

A third idealization extrapolated from the literature review is "paradigm shift" (Argyris 1977; Ingraham 1987; Mann 1991; Sabatier and Jenkins-Smith 1993; Deyle 1994; Schön and Rein 1994). As shown in Figure 4, it is the point of intervention which distinguishes paradigm shift from the previously discussed representations . In the paradigm shift process, the policy makers question the appropriateness of their operating norms, values, and/or policy objectives, resulting in the definition of a new problem for which solutions are sought. The learning which takes place has been termed "double-loop" learning (Argyris 1977), in contrast to single-loop learning, where there is no reassessment of the policy problem. Double-loop learning involves rethinking the "rules of operation" which govern a system. It requires an acknowledgment that defects exist within these rules. The conflicts which often erupt during environmental policy debates certainly have the potential to cause discontinuities in traditional thinking and problems to be redefined, as suggested by this model (Mazmanian and Kraft 1999). A shortcoming of the policy shift idealization is that it does not explicitly allow for external scientific/technical information to be brought to bear in decision-making. Given the importance of this type of information in environmental policy decisions (Meo et al. 1994), this representation cannot adequately explain environmental policy decisions.

Another drawback of the first three representations is that they do not allow for the effects of what have been termed "policy entrepreneurs" on policy decisions. Given

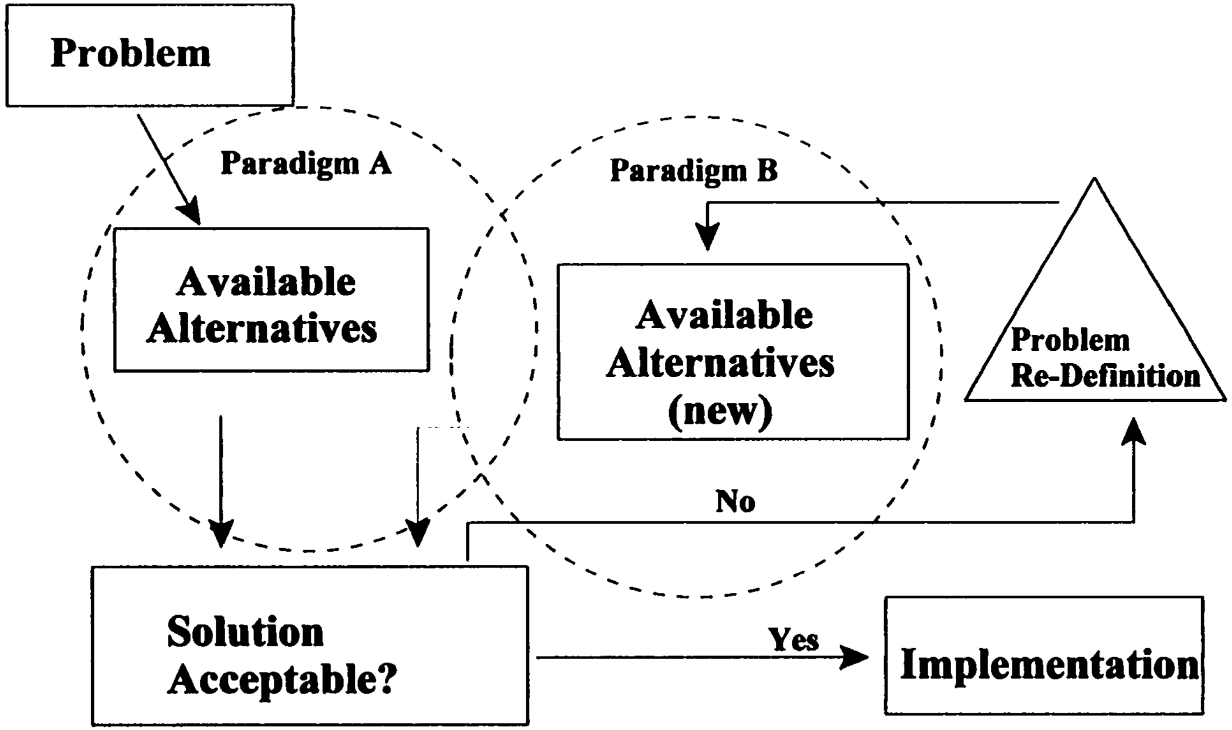

Figure 4. Idealized Representation of the Paradigm Shift Process

the important role these players appear to play in the policy process, their role in promoting innovation and social learning must be accounted for.

A fourth idealization, which can be termed "entrepreneurial-led" learning, is depicted in Figure 5 (Kingdon 1984; Roberts and King 1989, 1996; Ostrom 1990; Meo and Deyle 1993; Mintrom 1997; Zahariadis 1999). According to this model, entrepreneurs take an active role in three phases of the innovation/social learning process: 1) the creation of new ideas to address a problem; 2) design of solutions, and; 3) solution implementation. In order for a particular individual to be considered an entrepreneur under this model, they must be active in all three roles. Recent research into the nature of entrepreneurial activities, as related to environmental policy decisions, has questioned the need for these actors to be active in all three phases as required by this model (Meo and Deyle 1993). It appears as if the requirement that entrepreneurs be active in all three phases may be too stringent when dealing with complex environmental policy decisions. The cases studied in this research suggest that persons may only be active in one or two of these roles and still be considered entrepreneurs.

2 Decision-Making Schematic

None of the idealizations discussed above provided a good fit to the environmental policy innovations explored as part of this research. What was needed was a more generalized decision-making schematic which allows multiple points of entry in the process for scientific/technical information as well as policy entrepreneurs. Such a

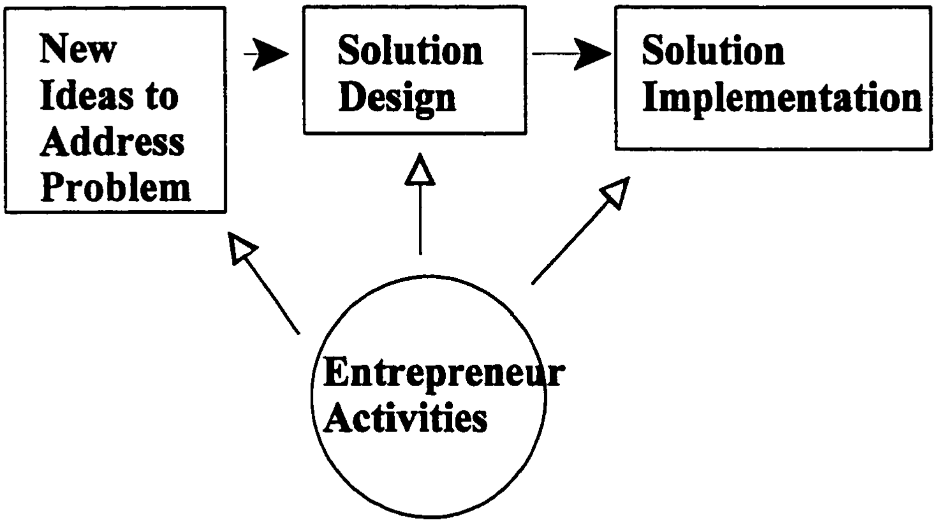

Figure 5. Idealized Representation of Entrepreneurial-Led Learning

schematic was developed, based on the information discovered in the three case studies, and is presented in Figure 6.

Development of the schematic proceeded through several steps. The first step was an analysis of the idealized representations presented above for applicability to the Tulsa cases. During this analysis, both the effectiveness and shortcomings of each representation in depicting the events which took place were identified. The second step was to combine those portions of the idealized representations which effectively depicted the case studies into a working representation of Tulsa. In this first step, all possible pathways were considered. The information from the case studies was then used to eliminate pathways which did not historically occur. The schematic was then refined further through the development of new pathways for the portions of the cases which remained to be described. Finally, the roles of both policy entrepreneurs and STI as seen in the case studies were incorporated in the representation.

The starting point in Figure 6 is the recognition by the policy entrepreneur that Problem A is significant and warrants attention. The search for a solution begins with the set of "accepted" alternatives. This set consists of the solutions known to have worked in the past for the policy system, and is a result of the prevailing policy paradigms, past successes and failures, and individual expertise available within the policy system. Once a potential solution is chosen it must be subjected to feasibility tests. If the solution is politically, technically, and economically feasible, then it is implemented and the system continues with "business as usual".

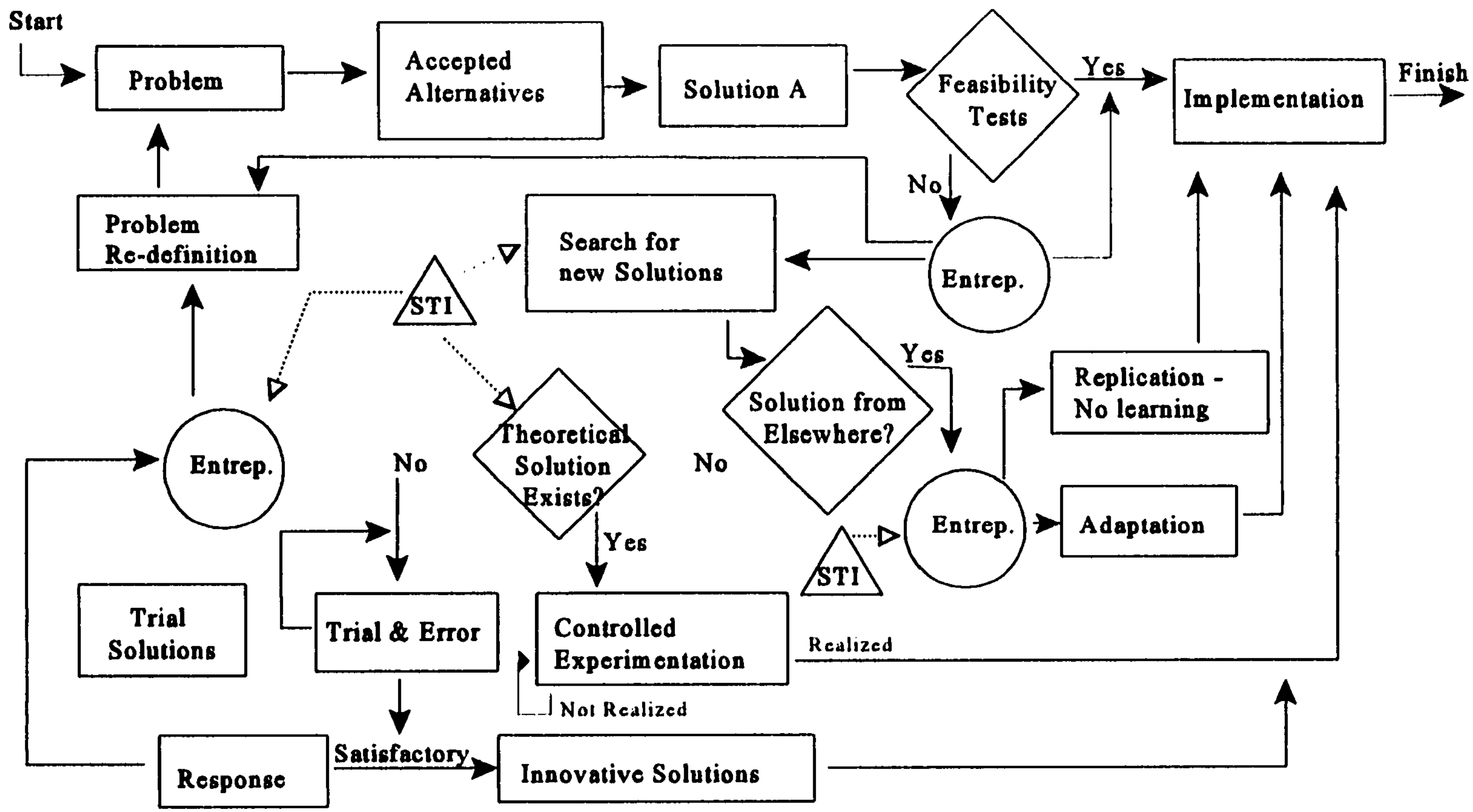

Figure 6. Decision-Making Schematic

If, however, the chosen solution (Solution A) does not pass one of these feasibility tests, the possibility for an innovation exists. The simplest path toward innovation occurs when Solution A is technically and economically feasible, but politically unacceptable. Here political entrepreneurs enter the system and alter it in such a manner as to make the known solution politically acceptable.

An example of this pathway (shown in orange in Figure 6) drawn from the Mingo Creek case study was the proposal by the U. S. Army Corps of Engineers (COE) to use detention basins for flood mitigation. The basins originally proposed by the COE were single-use, no frills basins (Reynolds 1994). These basins were politically infeasible, primarily because the citizens whose homes were located near the first proposed detention pond sites protested the placement of these facilities near their homes (Flanagan 1998). The decision was then made to alter the design of the detention areas, making them multiple-use areas. This decision not only solved the problem of citizen resistance (and therefore political infeasibility), it also served to allow the City of Tulsa (through the Public Works Department) to maintain control of the floodplains, prohibiting further development. In the words of one policy entrepreneur, "It was strictly a preservation thing ... preserving our own objectives. In order to save the floodplains, you had to make them usable by the public" (Flanagan 1998).

Oftentimes, the entrepreneur is unable to make a solution politically feasible. They must then begin a search for new solutions. The first search strategy in the decision-making schematic is to search for similar situations, and attempt to utilize the solutions developed elsewhere. If these solutions are adopted from elsewhere without making any changes to fit the current situation, this is simply replication, and no learning is said to have taken place. It is possible, however, that the entrepreneur may take the solution they have found and adapt it to their unique situation. The learning which takes place in this situation is dependent upon the entrepreneur's skillful blending of scientific/technical information and their own tacit knowledge of the local political environment. A useful example of this situation drawn from the case studies are the buyouts of floodprone homes along Mingo Creek. This pathway is shown in green in Figure 6. According to one entrepreneur, the idea came from knowledge that other cities had successfully accomplished such buyouts (T. Young 1999).

If satisfactory solutions cannot be found through an examination of other responses to similar situations, the entrepreneur must then determine if any "theoretical" solutions exist. Theoretical solutions are those solutions which have been proposed, but never actually implemented. These may be found in a variety of places. One source of theoretical solutions is the scientific or technical literature. Many entrepreneurs and politicians do not regularly read such literature, however. Thus, they may also rely on their own tacit knowledge of solutions which may have been previously proposed in the political arena, and not yet implemented for one reason or another.

The persons responsible for generation of innovative ideas, but not necessarily involved in their design and implementation, have been termed "policy intellectuals" (Roberts and King 1996). One of their primary functions is to frame the solution so as to make it politically feasible. They are responsible for placing a given solution before the relevant policy-makers, and providing reasons for its validity. They are often persons located outside the direct policy-making system, but who maintain an interest in problem solution. An example of a policy intellectual identified in the Ozone Alert! case study is

Ben Henneke, who some have referred to as an "idea man" (Pinc and Lasker 1998). Both the MERIT program and the initial concept of the FAR agreement were his ideas.

If such solutions are found and implemented, their results are then "tested" against some standard by which adequacy can be judged. This testing provides feedback to the existing knowledge-base from which solutions are drawn, thus providing incremental advances in theory. Once a successful solution is developed, the system continues on. This pathway (shown in blue in Figure 6) represents controlled policy experimentation, and, as discussed above, is very difficult to accomplish in actuality (Parson and Clark 1995). An example of controlled experimentation from the case studies is the MERIT trading program developed as part of the air quality case (Henneke 1999). However, this program was never actually implemented, and thus, the experiment never carried out.

According to the schematic, if there are no theoretical solutions upon which to base controlled experimentation, policy decisions can be made in one of two ways. The first method is the trial-and-error method. In this method, as in the idealized version presented in Figure 2, solutions are generated without any outside influences. They are then examined to determine whether or not they are satisfactory. If they are found to be satisfactory, they are implemented and the system continues on. If not, alternative solutions are chosen (again, seemingly at random) and the process begins again. While the literature supports this pathway as plausible (Behn 1988; Golden 1990), evidence of it was not seen in the cases of environmental policy studied as part of this research.

The trial-and-error method of decision making is not only inefficient, the nature of environmental problems is such that outside influences must be taken into account

(Holling 1995). These outside influences include the quantitative measures of environmental quality which all solutions must meet, scientific and technical information regarding the nature of the problem, and awareness of the political nature of the decision environment. The role of the entrepreneur in promoting innovative environmental policy in this situation is to interpret these outside influences, taking advantage of windows of opportunity which appear to promote innovative solutions. Many of the innovations studied as part of this research occurred through this (yellow) pathway in the model. A few examples are Tulsa's hazardous waste collection days, the Ozone Alert! program, and Tulsa's hiring of a recycling coordinator (in the M.e.t. case).

3 Decision-Making Schematics for Case Studies

The decision-making schematic presented above results from information gathered from the case studies as well as the literature review. Each of the cases of environmental policy innovation presented in the previous chapters displays examples of the various pathways of the schematic. This section discusses the relationship between the schematic and the individual cases.

3.1 Mingo Creek

In the Mingo Creek case, the initial problem was the significant flash flooding the city had experienced over a number of years. The accepted alternative, as shown in Figure 7, was to adopt floodplain management policies. Tulsa adopted such policies, meeting with only limited success. Their implementation was politically infeasible, due to the strong coalition formed by members of the development community. Several of the key entrepreneurs were active in the writing and implementation of these policies. However, following the 1984 floods, they realized that policies regulating individual developments alone were inadequate for solving the city's problems. "All it was doing was just trying to say we won't make it [flooding] any worse. But it was not turning the corner on solving the existing flood problems" (Hardt 1998). Thus, in an effort to not only prevent future problems, but also to solve the existing problems, the entrepreneurs began to search elsewhere for alternative solutions.

They hit upon the idea of buying out structures which had experienced repetitive flooding and also building regional detention areas in conjunction with channelization work. They discovered examples of municipalities (particularly Mobile, AL and Rapid City, SD) undertaking buy-out programs with varying degrees of success (Flanagan 1998). However, each of these municipalities had also encountered difficulties with their programs, and none had attempted a buy-out on the scale envisioned for Tulsa. Tulsa was therefore forced to adapt the idea of buying out properties to fit its unique circumstances, following the green pathway shown in Figure 7.

One manner in which the city was able to adapt their buy-out program was in the area of funding. As the federal government didn't have the funds available to support a buy-out of the scale envisioned, Tulsa leaders offered to fund half of the cost themselves (T. Young 1999). It was fortuitous that the city was in a position to be able to make this offer, using interest from larger than expected sales tax revenues. Had they not been able to make this offer, the innovation may not have materialized. The idea emerged from entrepreneurial blending of STI regarding legal financing methods and the skillful political maneuvering of the mayor and street commissioner.

Another idea which the entrepreneurs adapted to fit their unique situation was the

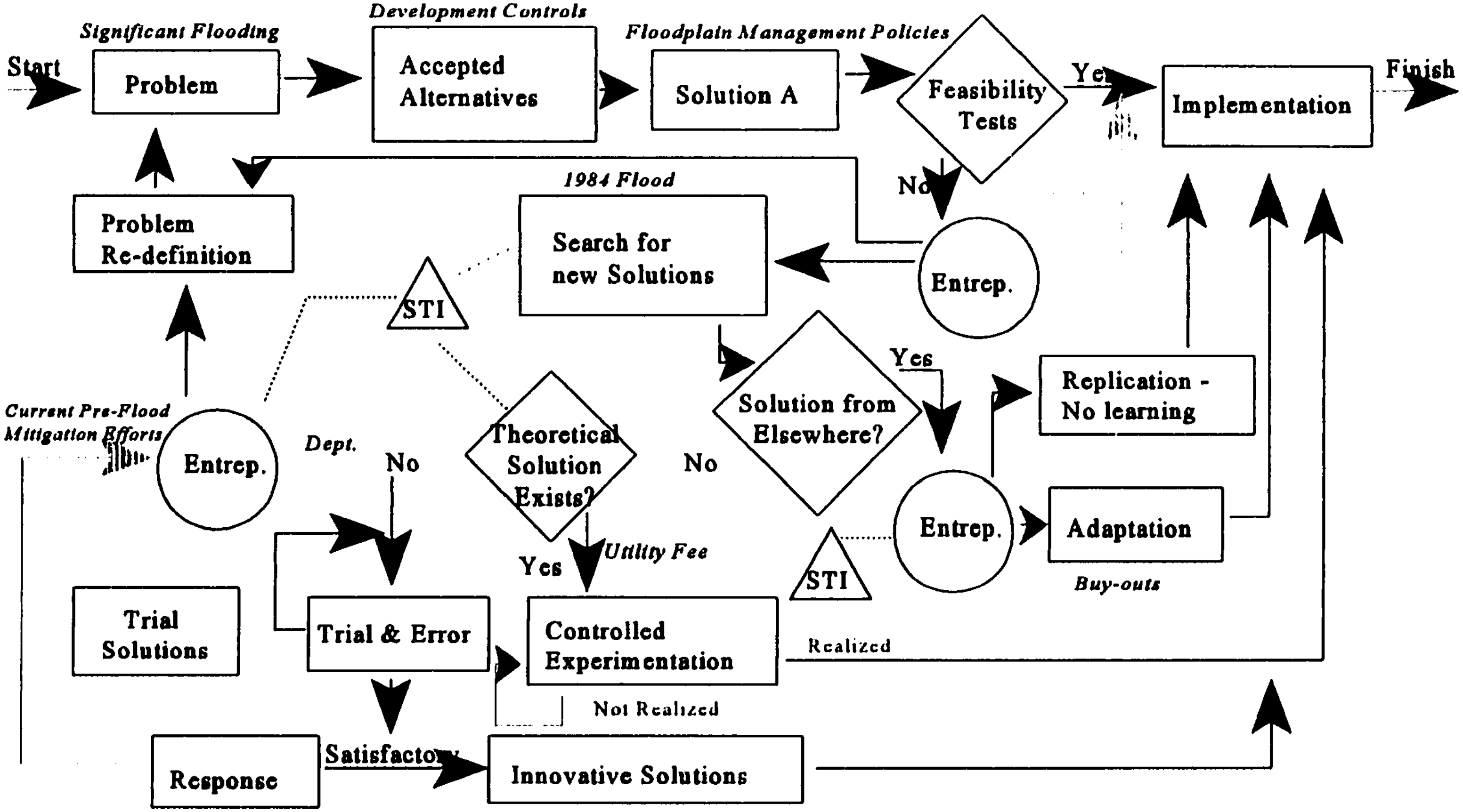

Figure 7. Decision-Making Schematic for Mingo Creek

concept of including regional detention facilities as part of the COE Mingo Creek project. "Ron [Flanagan] had latched onto the concept by going to some firms in Denver that were doing this exact same thing" (Hardt 1998). Once again, however, their entrepreneurial skills would be needed in order to win buy-in from the COE and the local citizenry, thus making the project politically feasible. In order to gain political feasibility, the entrepreneurs pushed for transforming the single-use facilities into multiple-use ones. "Some of the people that lived next to [our projects] later acknowledged at the dedication of our facilities that they thought it was going to destroy their property values, and that they literally were adamantly against it" (Hardt 1998). However, the success of the city's early multiple-use detention facilities allowed the entrepreneurs to sell the COE and citizens on the idea, provided, of course that the city fund what the COE considered the "extras". This pathway is shown in orange in Figure 7.

As the entrepreneurs began examining the reasons behind the devastation of 1984, they soon discovered that the condition of the city's stormwater infrastructure had played a major role. Solutions to the more difficult infrastructure problems were not readily available from other municipalities or from current theory. The entrepreneurs, following the yellow path shown in Figure 7, determined that in order to solve these problems, and also in order to ensure continuity of their efforts, a new city department would have to be created. Once again, they combined scientific and technical information to develop a trial solution. The information they relied upon most heavily was a consulting report which indicated that many of the functions relating to stormwater were being handled by different departments within the city (Hinkle 1999).

Once the department was formed, the entrepreneurs needed to find a stable source of long-term operational funding for it. A theoretical solution existed based upon a state supreme court ruling that sewers could be treated as a city utility (McNeill 1999). The development of the stormwater drainage fee therefore followed the blue path shown in Figure 7. The entrepreneurs undertook a controlled experimentation, deliberately setting the fee relatively low (Metcalfe 1998) and hoping that the matter would not be contested in court. The experiment appears to have been a success, as the fee has never been challenged (McNeill 1999) and in the years since its implementation, Tulsa's citizens have come to accept the fee and associate it with a given level of service (Hardt 1998).

The current efforts the city is making at acquisition and flood hazard mitigation follow the red path outlined in Figure 7. They have resulted from system response to the other program efforts which the entrepreneurs have undertaken. As discussed below in the other case studies, this pathway represents innovations which were not considered 100% successful. In the Mingo Creek case, however, much of this work is still in the planning stages, and it is yet to be determined whether it will result in successful innovations or not. Following flooding along Hager Creek in 1994, the city was able to buy and clear six homes within a short period of time (A. Patton 1995), indicating that these efforts may also be considered successful in the long-run. This attentiveness to system response is a valuable tool for entrepreneurs wishing to innovate within municipal government.

3.2 The Metropolitan Environmental Trust

In the case of The M.e.t., the original problem (Problem A) which the policy entrepreneurs encountered was the perceived lack of landfill capacity. The accepted alternative, as shown in Figure 8, was to build a new landfill. This option was not politically feasible, forcing the entrepreneurs to search for new solutions. Originally, this search took the form of developing scientific guidelines for siting new landfills. However, the mission quickly changed as the problem was redefined into one of how to provide recycling services to the member communities (Miner 1999). Once problem redefinition had occurred, the search for new solutions began anew.

The entrepreneurs were quite fortunate in that many municipalities across the country were also beginning recycling programs "this was a time when trash was being discussed all over the country and all these new trade journals came out" (M. Patton 1998). Thus, they were able to look around and easily find solutions from elsewhere. While a curbside recycling program represented a theoretical solution to their problems, it was not politically feasible, as it would require raising the trash rates to an unacceptable level. Instead, a drop-off program was seen as the answer "Because it was easier to implement. You didn't have to change the trash structure" (M. Patton 1998). The idea of drop-off centers was not simply replicated in this case. The entrepreneurs utilized information specific to each of the participating cities to design portable trailers which would keep the costs low and allow each site to individually determine which items would be collected. Thus, adaptations occurred and the implementation of drop-off recycling centers, followed the green path indicated in Figure 8.

The inclusion of household hazardous wastes and other unusual items such as eyeglasses as part of the items which are collected at the centers follows a different path. That path is indicated by the yellow arrows in Figure 8. In this case, there were no

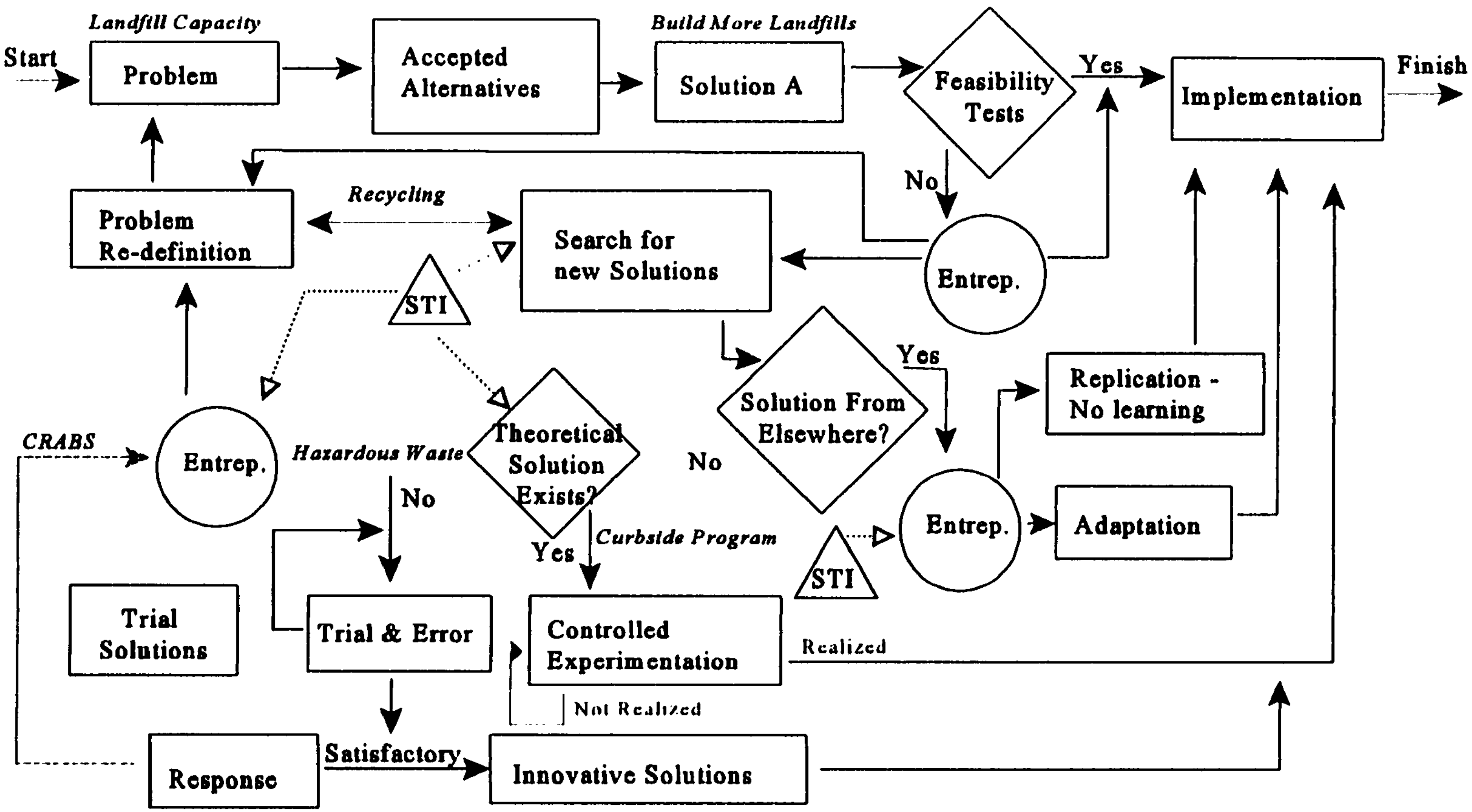

Figure 8. Decision-Making Schematic for The M.e.t.

solutions which could be borrowed from elsewhere. Hence, trial solutions were needed. However, the trials which occurred were not those of trial-and-error, they occurred due to the actions of entrepreneurs skillfully blending their tacit knowledge of the local environment with scientific and technical information regarding the nature of the local waste stream.

Some of this information was gained through the household hazardous waste collection events held at the fairgrounds. Some was gained through a careful researching of the laws governing hazardous waste. An example of this is when Mayor Savage requested that the centers take motor oil. Goodwill Industries responded that oil was hazardous and it would not place its workers in hazardous positions. The M.e.t. researched the hazardous waste regulations and realized that "... as long as we kept it from homes only, it would not be considered hazardous ..." (M. Patton 1998).

Not all of the innovations which occurred in this case received satisfactory responses once implemented. The red path in Figure 8 shows the fate of the CRABS commercial billing system. Due to the fact that the WTE plant was the first of its kind in the United States, there were no solutions which could be readily borrowed from other municipalities. In addition, no theoretical solutions to flow control existed. The entrepreneurs then determined that they could use their previous experiences with the storm water drainage fee to devise a billing system for commercial refuse disposal. A pilot study was conducted to gain the technical information required to determine the billing rates. Once implemented, however, the system received a negative response (in the form of a lawsuit) from the community. The entrepreneurs were forced to reexamine the data upon which charges were determined and develop a more equitable scheme.

The recent implementation of a voluntary curbside recycling program by the city follows the path indicated by blue arrows in Figure 8. This policy is too new to determine whether or not it will succeed or fail. However, it is an attempt at a policy experiment along the lines suggested by the proponents of adaptive management.

3.3 Ozone Alert!

The Ozone Alert! case to a certain extent is still ongoing. However, the case has developed sufficiently to determine the extent to which many of the innovations fit with the decision-making schematic presented above. The original problem (Problem A) in this case was a violation of the ozone national ambient air quality standard (NAAQS), as shown in Figure 9. The solution available from the set of accepted alternatives was the imposition of federally mandated-compliance strategies. This option was neither politically nor economically feasible. "Tulsa had undertaken a lot of improvements mainly in the private sector to meet EPA standards. ... And they probably accomplished 99% of what needed to be done to meet standards. The additional 1% costs, that 1% costs so much more than the previous 99% that it was hard to get people (industries) to do much more (JL)" (Pinc and Lasker 1998). The entrepreneurs then began a search for new solutions. In contrast to the previous case, however, this search did not involve any re-definition of the problem.

As the entrepreneurs began to look to other municipalities for solutions, they quickly found that none existed. While there had been previous efforts made at predicting ozone levels, no one had successfully done so (Bishop 1999). To the extent that the entrepreneurs knew, no other municipality had tried to use their predictions in

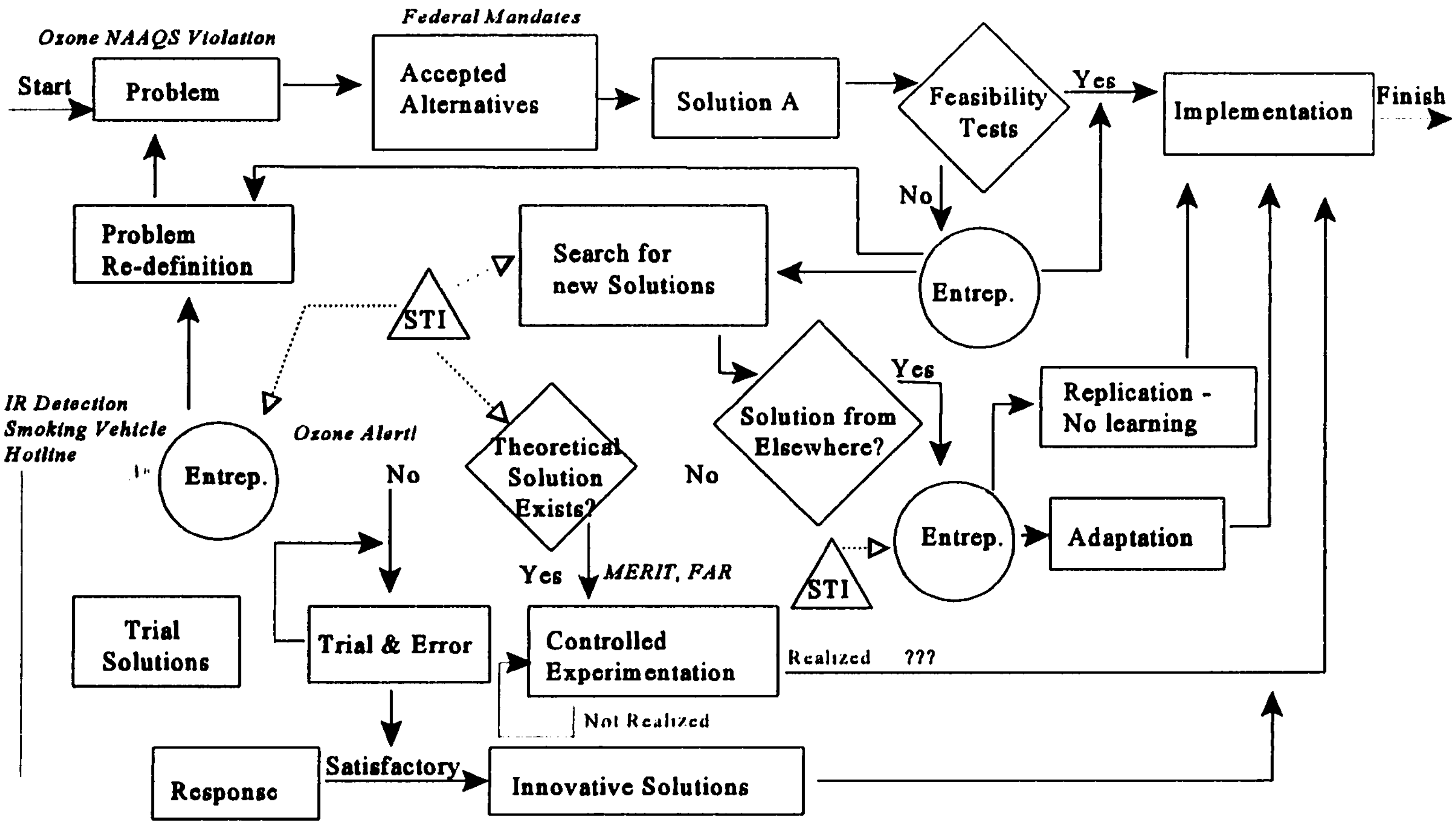

Figure 9. Decision-Making Schematic for Ozone Alert!

efforts to reduce ozone levels. They then began to look for theoretical solutions. Some of the theoretical solutions which the entrepreneurs had found, however, were not things which could be done in a short period of time (Henneke 1999). Therefore, while the evaluation of theoretical solutions continued, the intensity of the immediate crisis prompted the entrepreneurs to concurrently develop their own trial solutions. Thus, both the yellow and blue paths shown in Figure 9 were being followed simultaneously.

The immediate problem facing the entrepreneurs was to not have any further exceedances of the ozone standard during the 1991 ozone season (Pinc and Lasker 1998; Henneke 1999). This led the entrepreneurs to follow the yellow path indicated in Figure 9. As discussed in the case study, the actions which the entrepreneurs took were based upon both the available scientific evidence and the entrepreneurs knowledge of the situation. Hence, as shown in the figure, the trial solutions which were developed were not akin to those of trial-and-error. Many such trial solutions were developed under the Ozone Alert! program. Some of the most successful are the free bus rides, reduction of RVP in the local gasoline, and the development of ozone modeling capabilities. The constraints were such that some of the initiatives which were developed met with less success. For example, the portable infra-red detection of gross polluting vehicles and the smoking vehicle hotline were only partially successful. According to one entrepreneur, "A lot of people did not like the invasion of privacy (JL)" (Pinc and Lasker 1998). This pathway is shown in red in Figure 9.

Concurrent to the development of these solutions, the search for theoretical solutions continued, as indicated by the blue arrow in Figure 9. The first theoretical solution which was developed was the MERIT trading program. The MERIT program resulted from one entrepreneur blending the theoretical construct of emissions trading with the concept of operating a trading regime in a voluntary manner (Pinc and Lasker 1998). "But what hadn't been done was to try to figure out how you could do that kind of a system [emissions trading] with people being voluntary" (Henneke 1999). While the program was developed as part of the Ozone Alert! case, it was never implemented in Tulsa. Therefore the path shown in Figure 9 shows question marks leading from the controlled experimentation box to the innovative solutions box. However, the program has been proven to be an innovative solution elsewhere (Maurer 8/30/1996).

Another theoretical solution which was pursued as part of this case is the flexible attainment region (FAR) agreement. It clearly represents a case of controlled experimentation, even to the point that it is characterized as a "demonstration project"(Anonymous 7/30/1995). It resulted from the entrepreneurs' realization that, theoretically, Tulsa is in the best position to determine what compliance strategies work there (Pinc and Lasker 1998). The recent proposal of new ozone standards has left the status of the FAR agreement in question. It is therefore, as in the case of MERIT, unclear whether FAR will ultimately be deemed an innovative solution or not.

4 Summary

None of the representations of innovation extrapolated from the literature review portion of this research did an adequate job of explaining the innovation which took place in the case studies examined. As a result of the case study analysis, a more generalized decision-making schematic representative of the innovation/social learning process was developed. The original decision-making schematic developed during this research more adequately describes the processes of innovation and social learning. It makes clear the points of intervention for both policy entrepreneurs and scientific/technical information in the policy-making system, something lacking in the alternative representations.

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Chapter 7

Policy Entrepreneur Survey

1 Introduction

An analysis which complements the development of the decision-making schematic is the determination of the relative importance of several variables in the innovation/social learning process identified as important in the literature. This can be accomplished by a survey of policy entrepreneurs. Such a survey was developed and sent to the policy entrepreneurs interviewed during the development of the case studies. The survey was designed to capture the degree to which variables identified in the literature as key to the innovation/social learning process were seen in each of the three cases. A copy of the survey, in its final form, is included for review in Appendix D: Policy Entrepreneur Survey. Of the 28 surveys sent out, 24 responses were received.

The survey was developed in the following manner: 1) a draft questionnaire was designed and reviewed in a pilot test for clarity, organization, and design; 2) the pre-test reviewers were given the draft survey along with comments from the researcher, indicating what information each question was intended to elicit from respondents; 3) the judges were then asked to assess whether or not the question effectively evoked the intended information; 4) alterations to the survey were made according to the feedback received from the judges. This judging process served as a pilot test for the survey instrument.

The questionnaire consists of 15 closed-ended questions, with answers placed on a scale of 1 to 6, depending upon the importance of the variable in the particular question (Dillman 1978; Sudman and Bradburn 1982). Two additional questions were not aimed at judging importance of variables, and therefore were multiple-choice in nature. The survey questions were divided into two parts. The first part (Questions 1-4) focused on particular innovations. In these questions, the respondent was asked to choose one of the three cases (Mingo Creek, The M.e.t., or Ozone Alert!) with which he/she was most familiar, and then identify three specific innovations that occurred within the case. The respondent then answered questions regarding the type of information sources utilized and difficulties encountered during the implementation of each specific innovation. The respondent was presented with lists (based upon information found during the literature review) of possible information sources/difficulties and asked to rank each according to their relative importance.

The second section of the survey (Questions 5-17) consisted of questions which were aimed at the overall process of innovation which the entrepreneurs experienced. These questions did not refer to specific innovations, but to the chosen case as a whole. Again, the respondent was generally presented with lists (based upon information found during the literature review) of a variable number (from 2 to 20) possible information sources/difficulties and asked to rank each according to their relative importance.

2 Data Acquisition

Surveys were mailed to 28 policy entrepreneurs who had previously been interviewed during the case study analyses. Along with each questionnaire, each entrepreneur received a letter explaining the study and the purpose of the survey. The instructions encouraged all participants to answer the survey fully, providing additional comments as they deemed necessary. Self-addressed, postage-paid envelopes were included in the survey package as an incentive to complete and return the questionnaire. Follow-up letters, reminding the entrepreneurs about the survey and requesting a response, were mailed to non-respondents approximately two weeks after the initial mailing. Finally, telephone calls were made to those who still had not responded, asking them to respond in a timely manner.

The response rate, following these repeated attempts to solicit the maximum number of responses was 86% (24 of 28 surveys returned). As surveys were returned to the researcher, each respondent's answers were numerically coded and entered into a Microsoft Excel spreadsheet. Each respondent was given a unique identifier number, assigned as the surveys were returned. In addition, a code was entered to identify the case with which to identify the survey (1 = Mingo Creek, 2 = The M.e.t., and 3 = Ozone Alert!). For 15 of the 17 questions (the rating questions) the coding scheme used was the following: 1) answers recorded with a value of 6 (did not access) were assigned a value of zero; 2) answers recorded as very important (a value of 1) were coded with the value of 5, those recorded with a value of 2 were coded as 4 and so on. For question number 2, a value of 1-5 was assigned according to the order in which the answers appeared on the survey. For question number 3, the number of the selected answer was coded. For question number 8, a value of 1 was assigned to a "yes" response, and a value of 2 was assigned to a "no" response. The spreadsheet was then directly imported into Statistical Package for the Social Sciences (SPSS) software for analysis.

3 Data Analysis

An exploratory factor analysis approach was undertaken to examine the survey responses. The use of exploratory factor analysis is suggested when there are no *a priori* assumptions regarding the organization of patterns among a number of variables (Nunnally and Bernstein 1994). In this case, the literature suggested that the variables about which survey questions were asked were important in the innovation/social learning process; however, there was no hypothesized relationship among the variables for any given question. According to Nunnally and Bernstein (1994), an exploratory analysis "condenses the variables into a relatively small number of factors", which can then be used in further analysis. The goal in constructing factors is to explain the most variance possible with the smallest number of factors.

The method of exploratory factor analysis used for this research was principal component analysis (PCA). A separate PCA was carried out for each of six of the questions on the survey. PCA involves the solution of the characteristic equation of the correlation matrix with unities along the diagonal. The result is a series of vectors (called eigenvectors), their associated length parameters (eigenvalues), and their principal components (factors). PCA factors have the following properties (Nunnally and Bernstein 1994): 1) each factor explains the most variance possible in a sample of subjects; 2) the PCA method maximizes the variance explained for any number of factors; 3) the eigenvalues define the proportion of variance accounted for by each factor; 4) the factors are mutually orthogonal both geometrically and statistically.

In performing the PCA analyses, the following rules were used to eliminate resulting factors from further consideration and analysis (Nunnally and Bernstein 1994):

1) factors with eigenvalues greater than I were extracted; 2) variables with loadings greater than 0.5 on any given factor were retained; 3) any variables which had cross-loadings (loadings on more than one factor) greater then 0.5 were eliminated from all of the factors in which loadings were greater than 0.5; 4) only factors which had more than one variable with loadings greater than 0.5 were retained, and; 5) all variable loadings must be in the same direction. If variables loaded in different directions, two possibilities were considered. First, consideration was given to recoding the survey responses for the variable which loaded in a different direction. If this did not make sense in light of the particular question and variable, that variable was then eliminated from the factor.

For each question analyzed, the results of the PCA analysis are a series of factors which are constructed of the "most important" variables for that particular question (i.e. they explain the most variance possible). These factors were then subjected to a reliability analysis. In the reliability analysis, two things were checked. First, the correlation matrix was checked to make sure that all the variables retained for a given factor had positive correlations. Second, the reliability coefficient (called standardized item alpha in SPSS) was checked, to assure it was greater than 0.7 and greater than all of the individual item alphas if the item was removed (AIR). Any factors which produced reliability coefficients less than 0.7 were eliminated from further consideration. If the reliability coefficient was greater than 0.7 but less than any of the individual item alpha if the item was removed, that particular item (e.g. 1a) was removed from consideration because and the reliability analysis was conducted again. This process continued until the reliability coefficients were greater than the remaining AIRs.

The final step in the statistical analysis of the survey responses was the construction of new variables from the PCA factors remaining after the reliability analysis. These new variables were assumed to be linear combinations of the variables contained within each remaining factor. The linear combination was divided by the number of variables in order to standardize all variables by the number of items contained in each. As an example, the new variable Probdefl (which consisted of variables the respondents considered important in problem definition) was defined as the sum of variables 1a, 1b, 1d, and 1f divided by 4. (Variable 1a represents the responses to question 1a, etc). The new variables constructed from the PCA analysis were then used in one of two manners: 1) linear regression analysis was performed to determine if these variables could predict entrepreneur response to certain survey questions, and; 2) a series of one-way analysis of variance (ANOVA) analyses were performed to determine if significant differences were observed between the three case studies.

3.1 Principal Component and Reliability Analysis

The principal component analysis (PCA) was performed on questions number 1, 4, 5, 6, 8, and 17. For questions 1 and 4, the number of responses received was greater than 24, as each respondent was asked to answer questions 1-4 up to three times for each of three different innovations. The remainder of the survey questions dealt with the entire innovation/social learning process, and respondents therefore only answered these questions once. The results of this analysis are included in Appendix E: SPSS Results for Policy Entrepreneur Survey. Note that in Appendix E, variable names are assigned according to the question which they represent (for example One_A represents survey question 1a). Variable names representing the new variables constructed following the reliability analysis are explicitly discussed in the following paragraphs. The following discussion highlights the results found in Appendix E.

Question 1 asked the respondents to rank the relative importance of different information sources in determining the nature of the problem (i.e. in problem definition). The PCA resulted in four factors which cumulatively explained 77.7% of the variance. However, after following the rules presented above, only one multi-variable factor remained. This first factor was a combination of the following variables (corresponding information sources listed in parenthesis): 1a (academic journals), 1b (magazine articles), 1d (books), and 1f (specialized workshops). Relative to the other sources of information listed in the question, these four sources were regarded as the most important in defining the problem. It is interesting to note that variable 1e (had discussions with experts) was not retained in the PCA analysis, given the important role of experts as shown in the case studies. It would appear that expertise, while important in the overall innovation/social learning process, is not imperative in the problem definition phase, but that it becomes more important in the later phases such as the seeking of solutions, as indicated in the conceptual model.

Reliability analysis resulted in a reliability coefficient of 0.7870 for this factor. This is greater than the cut-off value of 0.7, therefore a new variable (Probdef1) was created using these four variables and the procedure outlined above. This variable was then used as an independent variable in the linear regressions and in the across-case comparisons discussed below.

Question 4 asked respondents to rank the importance of several barriers to innovation, having identified a specific innovation. Six factors explained 72.2% of the total variance. Of these six, only factors one and four remained after following the rules outlined above. The first factor indicated the following variables were important barriers to the innovation/social learning process: 4c (lack of understanding of scientific/technical information (STI)), 4g (solution required "thinking outside of the box"), 4m (not enough time to adequately analyze STI), 4o (lack of organizational diversity), 4r (lack of media support), 4s (lack of recognition), and 4t (fear of not being re-elected).

Four of the six variables found to be important barriers to innovation dealt with the institutional structure. Two variables address the ability of the decision-making system to incorporate STI. The case studies presented earlier accentuate the fact that the ability to effectively incorporate STI is important for innovation/social learning to occur. The other two variables address more general institutional structure issues (diversity and thinking "outside the box"). An idea supported by both the literature and the case study analysis is that the entrepreneurs play a key role in altering the institutional structure such that these barriers to innovation are effectively removed.

Reliability analysis resulted in a reliability coefficient of 0.7480, therefore a new variable (Barrier1) was created from these seven variables. This variable was then used as an independent variable in the linear regressions and in the across-case comparisons discussed below.

The fourth factor indicated that the following variables were important barriers: 4j (not acceptable to the public) and 4k (risk of failure). However, reliability analysis resulted in a reliability coefficient of 0.5558 which is below the acceptable level of 0.7. Therefore, no further analysis was performed using these particular variables.

Five factors explained 81.2% of the variance for Question 5, which asked entrepreneurs to rank the importance of several information sources in the search for new solutions. After following the rules for factor retention, the first two factors remained. The first factor consisted of the following variables: 5c (personal interviews with agency personnel), 5d (federal government sources), and 5g (expert opinions/guidance).

This factor can therefore be interpreted as indicative of the importance to the entrepreneurs of outside technical expertise. Again, both the case studies and the literature review point to the importance of expertise. However, the research presented herein is among the few studies which explicitly addresses how this expertise is incorporated into the innovation/social learning process.

The reliability coefficient corresponding to this factor was 0.8531, therefore a new variable (Search1) was created for use in the across-case comparisons discussed below.

The second factor was a combination of the following variables: 5h (private contract service) and 5i (independent field reports). This factor consists of variables which are representative of outside expertise. As mentioned previously, it appears that the importance of outside expertise lies in its ability to aid the entrepreneurs in their search for new solutions. The reliability analysis resulted in a reliability coefficient of 0.7597. A new variable (Search2) was constructed for use in the across-case comparisons.

Question 6 asked the entrepreneurs to rank the importance of several factors in the process of adapting "borrowed" solutions to Tulsa's situation. The PCA produced 3 factors which explained 79.3% of the variance. The first factor is composed of the following variables: 6d (personal interviews with agency personnel), 6g (personal experience and opinions), 6h (expert opinions/guidance), and 6i (private contract service). Once again, these variables reflect the contribution of outside expertise to the innovation/social learning process. Not only do experts serve as an aid to the entrepreneurs' search for new solutions, but they are also important in helping them to adapt these solutions to their unique circumstances. Reliability analysis resulted in a reliability coefficient of 0.8540, therefore a new variable (Adapt1) was constructed for use in the across-case comparison. After following rules for variable retention, the other two factors dropped out of the analysis.

In Question 8, the entrepreneurs were asked if they felt the city of Tulsa had learned from its experience with environmental policy innovation. If they answered yes, they were then asked to rate the relative importance of several variables in the city's ability to learn. PCA analysis resulted in 3 factors which explained 74.8% of the variance. However, after following the rules for variable retention, only 1 factor remained. This factor is composed of the following variables: 8a (information analysis), 8c (information flow), and 8d (information use). This factor clearly shows the importance of STI in the innovation/social learning process. As shown in the case studies and outlined in the conceptual model, the entrepreneurs serve an invaluable role in the process of information flow and analysis. Reliability analysis resulted in a reliability coefficient of 0.8263, therefore a new variable was constructed (Learn1) for use in the across-case comparison.

Question 17 asked respondents to indicate the importance of several techniques which they learned during the innovation process and are currently applying to environmental policy decisions. The analysis produced 6 factors which explained 84.3% of the overall variance. After following the rules presented above, the first factor (consisting of the following variables) remained: 17a (organizational flexibility), 17b (development of task forces), 17d (recruitment of technical expertise), 17i (public participation/support), 17m (use of volunteers), 17r (community involvement), and 17s (crisis motivating change).

Reliability analysis resulted in a reliability coefficient of 0.8741. However, it also indicated that a higher value could be achieved if the variable 17s was removed. The reliability analysis was repeated for a new variable which did not include 17s as a component, however, once again, the results indicated that a variable should be removed. This process was continued until the reliability coefficient obtained was greater than all of the resulting reliability coefficients if a component variable was removed. The final reliability analysis obtained was 0.8906 for a factor containing the variables 17a, 17b, 17i, 17m, and 17r. A new variable (Apply4) was constructed using these variables for use in the linear regression and across-case analyses. The important variables retained for this factor are all reflective of the type of institutional environment and structure which the entrepreneurs feel is important in the innovation/social learning process. The institution should remain flexible, perhaps through the use of task forces developed to address specific concerns (such task forces would facilitate the inclusion of outside expertise). They also feel that it is important to build public support and community involvement, perhaps through the use of volunteers.

The second factor consisted of the variable 17e (accessing external information) and 17p (systems/holistic thinking). Once again, the important role of external information was underscored in this factor. Approaching the problem from a systems point of view was also considered important. This would seem particularly relevant to environmental problems, which are often interdisciplinary (and interdepartmental) in nature. Reliability analysis resulted in a reliability coefficient of 0.7197, therefore a new variable (Apply5) was constructed from these variables for use in both the linear regression analysis and the across-case comparison.

3.2 Regression Analysis

Regression analysis was performed to determine if the new variables could predict responses to certain survey questions. For example, question 2 asked respondents to indicate how quickly they became familiar with the problem (i.e. how quickly the problem was defined). Interesting questions to ask regarding this particular survey item are whether the types of information found important in problem definition (Probdef1) or the important barriers (Barrier1) are indicative of entrepreneurs' responses to this question. As seen in Appendix E, only the linear regression of the Barrier1 variable on question 2 was statistically significant at the 0.05 level (significance = 0.013). The relationship was positive, thus the more important the barriers were considered, the longer it took the entrepreneurs to become familiar with the problem.

Question 3 asked the entrepreneurs to rate the ease with which solutions were found and adopted. The variables Probdef1 and Barrier1 were again used as the independent variables for the regression analysis. The regression involving the problem definition variable was statistically significant (P = 0.006), with a positive correlation. Thus, the more important the entrepreneurs found the information used in problem definition, the more difficult they found the adoption of solutions. Perhaps this is due to the fact that the more informed the entrepreneurs were regarding nature of the problem, the more they were aware of limitations regarding any particular solution. The regression of the Barrier1 variable on question 3 was not statistically significant at the 0.05 level (P = 0.069).

The first portion of question 8 asked the entrepreneurs whether or not they felt the city of Tulsa had learned from its past experiences with environmental policy innovations. The regression analysis was performed using each of the following variables: Learn1, Apply3, Apply4, and Apply5. However, as can be seen from the results in Appendix E, none of these regressions were statistically significant. Therefore, both the factors that the entrepreneurs felt were important in the city's ability to learn and those which they continued to apply in new policy-making situations were not indicative of whether the entrepreneurs felt the city had learned. While these are not the results one would initially expect to encounter, perhaps this is because of a discrepancy between the entrepreneurs' and researcher's definitions of "learning".

3.3 Across-Case Comparisons

Differences in survey responses among cases was tested by one-way ANOVA. The ANOVA was performed using the variables constructed following the PCA analysis. The ANOVA results are also presented in Appendix E.

Statistically significant differences (at the 0.05 level) were observed for the variables Probdef1 (significance = 0.033) and Search2 (significance = 0.047). The variable Probdef1 was most important for the respondents answering for The M.e.t. case. This variable rated higher among Mingo Creek respondents than Ozone Alert! entrepreneurs. Given that this variable represents journals, magazines, books, and specialized workshops, this result is not surprising, as the entrepreneurs in The M.e.t. case indicated that they had greater access to these types of information than did the entrepreneurs in the other cases (M. Patton 1999). Indeed, at the time The M.e.t. was evolving, there existed an abundance of trade journals devoted to the subject of municipal solid waste and recycling.

Statistically significant differences also were found for the variable Search2. This variable is indicative of the importance of outside expertise in the search for new solutions. Again, this variable was most important to the entrepreneurs in The M.e.t. case, followed by the Mingo Creek case, and finally the Ozone Alert! case. The responses included in this variable are private contract services and independent field reports. Once again, the meaning behind the statistical significance is not readily apparent and caution should be exercised in its interpretation, given the fact that its significance level is quite near the 0.05 level. It is possible that these types of information were more readily accessible to the entrepreneurs active in The M.e.t. case than the other two cases. It is also possible that lack of access to other types of information (such as federal government sources) precluded their use by the entrepreneurs active in The M.e.t. case.

4 Conclusions

Table 7-1 summarizes the variables which the entrepreneurs found important during the innovation/social learning process. These results support several tentative conclusions. First, the PCA analysis underscored the importance of scientific/technical information (STI) and outside expertise in the innovation/social learning process. Not only must the entrepreneurs have access to STI, but it must be of a certain quality (i.e. it needs to be credible). Expertise was seen as particularly important in the identification and adoption of new solutions, once the problem was well defined. The information used in problem definition was indicative of the difficulty the entrepreneurs encountered adopting new solutions. Also, barriers to innovation were indicative of the amount of time it took entrepreneurs to feel they had clearly defined their problem. Slight differences were seen between the three cases for both the types of information used to define the problem and for the nature of the information used in the search for new solutions.

Table 7-1. Summary of Important Variables

Process	Important Variable(s)
Problem Definition	Academic Journals Magazine Articles Books Specialized Workshops
Barriers to Innovation	Lack of Understanding of STI Solution Required "thinking outside the box" Not Enough Time to Adequately Analyze STI Lack of Organizational Diversity Lack of Media Support Lack of Recognition Fear of Not Being Re-elected
Search for New Solutions	Personal Interviews with Agency Personnel Federal Government Sources Expert Opinions/Guidance
	Private Contract Service Independent Field Reports
Adapting Borrowed Solutions	Personal Interviews with Agency Personnel Personal Experience and Opinions Expert Opinions/Guidance Private Contract Service
Ability to Learn	Information Analysis Information Flow Information Use
Characteristics of Learning Environment	Organizational Flexibility Development of Task Forces Public Participation/Support Use of Volunteers Community Involvement
	Accessing External Information Systems/Holistic Thinking

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Chapter 8

Lake Eucha Model Testing

1 Introduction

To determine the applicability of the decision-making schematic, the problem of water quality at Lake Eucha, an environmental dilemma currently being faced by the city, was examined. Lake Eucha serves as one of two primary sources of drinking water for the city. In recent years, high levels of nutrients have been found in the lake, causing eutrophication which results in taste and odor problems, as well as additional operating expenses for Tulsa's water treatment facilities.

A somewhat shorter case study was developed documenting the emergence of the issue on Tulsa's policy agenda using the same methods as the previous case studies. A survey was then administered to policy elites and technical experts active in the current debate over how to maintain Lake Eucha's water quality. The survey results were compared to those of the policy entrepreneurs.

2 Case Description

Lake Eucha was built in 1952 and is owned and managed by the city of Tulsa. The Lake Eucha watershed encompasses roughly 230,000 acres, approximately 40 percent of which is located in Arkansas (Lassek 3/12/97). Lake Eucha, in turn, supplies water to Lake Spavinaw. The city of Tulsa draws nearly half of its drinking water supply from the Eucha-Spavinaw watershed (Savage 1998). In 1995, the city commissioned the Oklahoma Conservation Commission (OCC) to perform a Clean Lakes study to investigate recurring taste and odor problems associated with Lake Eucha. Clean Lakes studies are financed by the U. S. Department of Agriculture (USDA) and the U. S. Environmental Protection Agency (EPA), as well as by a local match.

In early 1997, the OCC released the results of the Clean Lakes study, which found average annual total phosphorus and nitrate nitrogen plus nitrite nitrogen concentrations increasing dramatically in recent years (Oklahoma Conservation Commission 1997). The study points to non-point source pollution (NPSP) as one of the most likely causes of the increasing nutrient levels. Another pollution source is the city of Decatur, Arkansas which has a permit to discharge treated wastewater into the watershed (Lassek 3/13/1997). NPSP attributes approximately 50% of the nutrients to the lake, while point sources contribute roughly 30% (Lassek 5/4/1997). NPSP refers to diffuse pollution sources not resulting from a specific location (such as a pipe). It results from runoff, precipitation, percolation, or atmospheric deposition which can carry pollutants throughout a watershed. While the measured pollutant concentrations from any single source may seem insignificant, when combined from an entire watershed, the results of NPSP can be significant. NPSP degrades aquatic systems by altering their physical and chemical quality and can have dramatic biological effects. Common sources of NPSP include urban and agricultural runoff, construction activities, physical changes to stream channels, and habitat degradation (Thomann and Mueller 1987).

One primary source of NPSP for the lake is the rapidly expanding poultry industry located in the region. According to the OCC report, the amounts of phosphorus and nitrogen excreted by poultry in the watershed is equivalent to the untreated waste of approximately 11 humans per acre (Oklahoma Conservation Commission 1997). The increased nutrient loading to the lake results in algal blooms, which result in low dissolved oxygen levels in the lake. This results in taste and odor problems at the tap. In order to treat these problems, the city is forced to treat water more extensively. The increased treatment efforts not only result in higher operational costs for the city, but can also prevent certain industries which require extremely high-quality raw water from locating in Tulsa (Pearson 3/16/1997).

2.1 Statewide Response

The report's implication that the nutrient problems primarily resulted from poultry operations sparked controversy among different state agencies and poultry producers. Jim Britton, an Oklahoma State University extension poultry specialist, is quoted as saying "It was irresponsible for an agency to look at a phosphorus [reading] and say it was chicken phosphorus" (Lassek 5/4/1997a). At the time the report was released, concern had been mounting throughout the state over issues related to large scale animal feeding operations (Ervin 5/8/97). In response, Governor Frank Keating formed an Animal Waste and Water Quality task force, comprised of private citizens (many cattlemen, poultry or pork producers) and agency representatives. The task force was charged with examining the current and past disposal of animal waste and its effect on the quality of Oklahoma's water supply.

The task force presented its final report, which included more than 50 recommendations, to the governor in December, 1997. One of the recommendations was for the legislature to enact a separate poultry industry regulation bill. Later that month, the Oklahoma Department of Agriculture (ODA) enacted emergency rules regulating the state's poultry industry. The rules required poultry operators to implement approved management plans, soil testing prior to land application of litter, record keeping requirements, storage of litter in covered sheds, and biannual facility inspections by integrators (Ford 12/20/1997). Interestingly, while the rules required soil to be tested prior to additional land applications, they did not set a permitted level of phosphorus in the soil (Anonymous 12/24/1997).

The next year, Oklahoma legislators could ignore the issue of poultry waste no longer. Several bills were introduced in both houses, most of which never made it out of committee. On May 20, 1998, in Tulsa, Governor Frank Keating signed into law a bill that was the first in the nation to impose regulations on the poultry industry (Lassek 5/21/1998). The law (Title 35 Chapter 17 Subchapter 5 Oklahoma Statutes (O.S.)) requires all poultry growers to register annually with ODA, pay a registration fee, and maintain an approved animal waste management plan. It requires the large poultry corporations to make contributions to an educational program on poultry waste handling, further requiring all operators to obtain a given number of hours education annually. Regarding land application of waste, it allows land application only by persons certified to perform such work and requires soil waste testing prior to land application.

2.2 Tulsa's Response

The release of the OCC report initiated action by the city of Tulsa. About six months prior to its release, the public works department approached the mayor's office, concerned about citizen reaction to the study's results (East 2000). It was decided that Tulsa would take a proactive role regarding this issue, preferring to help shape policy, rather than having it dictated from elsewhere. The city is acting strategically, forging working partnerships with the other stakeholders and advancing the state of the scientific knowledge regarding the watershed.

Much of the city's actions occurred within the Tulsa Metropolitan Utility Authority (TMUA), the agency responsible for maintaining Tulsa's drinking water supply. Utility Board member Richard Sevenoaks commented, "Now we find out a community upstream is affecting the drinking water of a population of 550,000 downstream. We have no choice but to take a leadership role. We know what can happen" (Lassek 3/13/1997).

After the study results were officially released, Tulsa city officials responded quickly, seeking funds for further studies in its 1997/98 budget, and calling for a cooperative effort to find solutions to the NPSP problem (Lassek 3/28/1997). Tulsa Mayor Susan Savage is quoted as saying, "We must find a solution that makes sense for everyone. ... We have a tremendous amount to gain if we work together. Nobody wants to regulate the agricultural industry. Regulatory responses take the most time and are the most difficult to implement" (Lassek 3/28/1997b).

In an effort to become more fully informed regarding the issues surrounding animal waste, the city began collecting information from states and cities across the country that had programs addressing pollution from animal waste (Lassek 5/6/1997). It also began to build a team of experts to develop a comprehensive plan for dealing with poultry waste (Lassek 6/8/1997). "A couple of board members went to learn what they are doing in another part of the country on litter" (Slaughter 2000). As the issue took on statewide importance, Tulsa city leaders actively began to draft model legislation which would include the measures it felt were important (East 2000). However, they also knew that they could not depend solely upon legislation to solve their problem.

As they built their team of experts, they were careful to include representatives from all interested parties in the discussions. In December, 1997 TMUA board members and the mayor met with representatives from the poultry industry in an attempt to negotiate a strategy limiting the amount of waste disposed of in the Eucha-Spavinaw watersheds during the scheduled March chicken house clean-outs. Patsy Bragg, vice-chairwoman of TMUA, commented, "This is our window of opportunity to try to make the best effort to ensure that whatever litter is spread on fields it is done in a way that won't adversely affect the water supply" (Lassek 12/5/1997). As a result of their inclusion, the poultry industry agreed to a 12-step voluntary program aimed at providing some "short-term solutions and long-term possibilities for handling waste produced in Arkansas and Oklahoma" (Schafer 12/6/1997). One of the important short-term actions the industry agreed to was to complete soil phosphorus testing (in both Oklahoma and Arkansas) before March 1998. They also agreed to work with the city and INCOG to gather information regarding the number and types of poultry operations in the watershed, determine how each operation deals with waste, aid growers in finding alternative disposal methods in areas with excess soil phosphorus, and participate in watershed management teams (Anonymous 12/6/1997).

The city's efforts to build a team approach toward long-term solutions continued into 1998. Early that year, the mayor was asked to become a participant in ODA's efforts to coordinate the efforts of state agencies dealing with poultry waste issues. Oklahoma Secretary of the Environment Brian Griffin is quoted as saying, "Mayor Savage and TMUA have already shown their ability to play an important part in shaping the solutions that we will develop statewide on non-point source pollution" (Lassek 2/9/1998). Tulsa's efforts garnered the city national attention when the mayor was asked to testify before the Senate Agricultural Committee during a hearing on animal waste management (Lassek 3/29/1998). Further national attention resulting from Tulsa's efforts came when the mayor was chosen as one of three members appointed by President Clinton to the National Recreation Lakes Study Commission.

As the team continued to search for long-term solutions, several experimental efforts were begun. One such effort, which has met with mixed success, was the establishment by ODA of a poultry-litter hotline. The hotline allows litter producers to link with potential litter buyers outside of sensitive watersheds (Shafer 4/8/1998). One of the difficulties with this approach, however, is the large cost associated with transporting the litter. The state Conservation Commission also received a large grant from the EPA in which specific best management practices will be implemented in Beatty Creek and the effects of the practices monitored for 5 years (Lassek and Myers 6/11/1998; Lassek 4/11/1999b). The city has also created a Watershed Management Team and three work groups (Lassek 4/11/1999a) to continue efforts to address these issues. Together with the Indian Nations Council of Governments (INCOG), the city has prepared a watershed restoration action strategy (WRAS) in response to the federal government's clean water action plan. The report describes specific public outreach, monitoring and evaluation, problem definition, and action goals which are to be met over the coming years.

One obstacle which has hampered the city's efforts to determine solutions has been the small amount of scientific and technical information (STI) which was available. The policy surrounding poultry waste has moved much more quickly than the science in this case (East 2000). However, Tulsa has been proactive in advancing the state of STI as well. "Meanwhile, we proceeded with defining what science information we were going to need and contracting for it" (Slaughter 2000). One of the major contributing factors Tulsa brings to advancing the STI is a partnership with the law firm Gardere and Wynne (East 2000). TMUA board member Patsy Bragg is a partner in the firm. The firm has expertise in oil and gas exploration and as such has an excellent global positioning system (GPS). They generously helped to create and donated a GPS platform for use by the city. The system allows officials to graphically overlay the data which has been collected regarding the watershed.

The agreement worked out between the city and the poultry industry representatives has advanced this system significantly. As part of the agreement, they have provided the city with critical information about the current state of poultry operations within the watershed. The database has also benefitted from work being conducted at Oklahoma State University, particularly regarding soil phosphorus levels. The database information is available to the public via TMUA's website (http://www.tulsawater.com/). OCC's current Beatty Creek project will also serve to provide additional STI which the policy-makers can then use for decision-making.

Tulsa's efforts to find long-term solutions to protect its water quality have been remarkable. Currently, the city is attempting to collect the STI it deems necessary for informed decision-making to proceed. While the dilemma is too new to determine if environmental policy innovations will be devised as part of the efforts, it appears as if the city is headed in that direction. Mike Bira, nutrient coordinator for the EPA has stated, "Tulsa has taken the leadership role in many regards. The things they are going to be deciding in the next three to five years will set a lot of the standards across the nation in the way urban areas approach their water supplies" (Lassek 4/11/1999a).

The city has successfully forged partnerships willing to work to solve the nutrient problems of Lakes Eucha and Spavinaw. "Everybody's at the table. You have integrators, you have bureaucrats, you have scientists. It's people who operate the lakes, and people who would like to benefit from changing the process as well" (Slaughter 2000). The WRAS states "an unprecedented spirit of cooperation has been established between parties that have divergent interests in poultry production and animal waste disposal" (Indian Nations Council of Governments 1999). Recent reports indicate that the lake may be aging more quickly than it was once thought (Anonymous 12/16/1999), should this prove to be the case, Tulsa has positioned itself to deal with the aging in a positive manner.

3 Participant Survey

A survey questionnaire was sent to policy elites and technical experts active in the current debate over how to maintain Lake Eucha's water quality. The survey was designed to capture the degree to which variables identified in the literature as key to the innovation/social learning process were evidenced in the Lake Eucha case, and to compare and contrast a current environmental policy problem with the cases previously reviewed. A copy of the survey, in its final form, is included for review in Appendix F: Eucha & Spavinaw Lakes Participant Survey.

As can be seen in the appendix, the survey is nearly identical to that discussed in Chapter 7. It consisted primarily of closed-ended questions, with answers placed on a scale of 1 to 6, depending upon the importance of the variable in the particular question

(Dillman 1978; Sudman and Bradburn 1982). Some questions were not aimed at judging importance of variables, and therefore were multiple-choice in nature. However, as no specific innovations have yet been identified, all questions pertained to the overall process of policy-making which the respondents are experiencing.

3.1 Data Acquisition

Surveys were mailed to policy elites and technical experts active in the current debate over how to maintain Lake Eucha's water quality. Along with each questionnaire, the entrepreneur received a letter explaining the study and the purpose of the survey. The instructions encouraged all participants to answer the survey fully, providing additional comments as they deemed necessary. Self-addressed, postage-paid envelopes were included in the survey package as an incentive to complete and return the questionnaire. Follow-up letters, reminding the entrepreneurs about the survey and requesting a response, were mailed to non-respondents approximately two weeks after the initial mailing.

Six of the respondents replied that they did not wish to participate in the survey. Of the remaining 72 surveys, 22 were returned, yielding a response rate of 31%. As surveys were returned to the researcher, the respondent's answers were entered into a Microsoft Excel spreadsheet in numerical format, coding then in the same manner as the policy entrepreneur survey. The spreadsheet was then directly imported into SPSS for statistical analysis.

3.2 Data Analysis

An exploratory factor analysis approach was again undertaken to examine the survey responses. The techniques used were the same as those undertaken for the entrepreneur surveys discussed in Chapter 7.

3.2.1 Principal Component and Reliability Analysis

The principal component analysis (PCA) was performed on questions number 1, 4, 5, 6, 8, and 17. Question 1 asked the respondents to rank the relative importance of different information sources in determining the nature of the problem (i.e., in problem definition). The PCA resulted in three factors which cumulatively explained 78.1% of the variance. However, after following the rules presented above, only one multi-variable factor remained. This factor was a combination of the following variables (corresponding information sources listed in parenthesis): 1a (academic journals), 1b (magazine articles), 1d (books), 1f (specialized workshops), 1g (obtained information from government agencies other than my own), and 1i (internet research). These six sources were regarded as the most important in defining the problem. Four of these six variables were also considered important in the entrepreneur survey results, and reflect the importance of outside information sources in the innovation/social learning process. The two additional variables included by the Lake Eucha survey respondents reflect the following: 1) the nature of the case and Oklahoma's water quality infrastructure is such that it would necessarily require inter-agency information exchange, and; 2) the increased availability of information via the internet since the cases examined earlier were undertaken.

Reliability analysis resulted in a reliability coefficient of 0.7870 for this factor. This is greater than the cut-off value of 0.7, therefore a new variable (Probdefl) was created using these six variables and the procedure outlined above. This variable was then used as an independent variable in the linear regressions discussed below.

Question 4 asked respondents to rank the importance of several barriers to solution adoption. PCA results found that 7 factors explained 86.9% of the total variance. Of these factors only factors one and two remained after following the rules outlined above. The first factor indicated the following variables were important barriers to the innovation/social learning process: 4a (inadequate scientific/technical information(STI)), 4b (unavailable STI), 4c (lack of understanding of STI), 4d (lack of timely STI), 4l (lack of regulatory flexibility), 4p (solution sought too quickly), and 4t (fear of not being re-elected). Only two of these variables (4c and 4t) were the same as those found in the first factor for this question on the entrepreneur survey. It appears that in the Lake Eucha case, the importance of obtaining timely and useful STI has served as a significant barrier to policy-making thus far. The lack of clear entrepreneurs in this case emphasizes the importance of entrepreneur's role in the innovation/social learning process of providing STI to policy-makers. Perhaps entrepreneurs will emerge to help the Lake Eucha decision-makers overcome some of these important barriers.

Reliability analysis resulted in a reliability coefficient of 0.8801, therefore a new variable (Barrier1) was created from these seven variables. This variable was then used as an independent variable in the linear regressions discussed below.

The second factor indicated that the following variables were important barriers: 4g (solution required thinking "outside the box"), 4i (not acceptable to politicians), and

4n (difficulties interacting with other agencies). However, reliability analysis resulted in a reliability coefficient of 0.7051 but the AIR for item 4i was 0.7451, therefore, this item was removed. Repeated reliability analysis using just variables 4g and 4n resulted in a reliability coefficient of 0.75, therefore a new variable Barrier3 was created using these two factors. These variables, seemingly have nothing in common upon first inspection. However, one manner of overcoming difficulties interacting with other agencies is to think along other than traditional lines. In the entrepreneur survey results, only one barrier factor remained. Therefore, a comparison between the two sets of survey results is not possible for this factor.

Four factors explained 79.59% of the variance for Question 5, which asked entrepreneurs to rank the importance of several information sources in the search for new solutions. After following the rules for factor retention, the first factor was the only one which remained. The first factor consisted of the following variables: 5b (personal interview with academics), 5c (personal interviews with agency personnel), 5d (federal government sources), 5e (state government sources), 5f (personal experience and opinion), and 5g (expert opinions/guidance).

As was the case with the entrepreneur surveys, this factor can be interpreted as indicative of the importance to the entrepreneurs of outside technical expertise. Again, both the case studies and the literature review point to the importance of expertise. In this case, three additional variables (5b, 5e, and 5f) were considered important. However, only one of these does not reflect the influence of outside expertise, but that of individual expertise. In this case, in contrast to the case studies analyzed earlier, the survey respondents were likely to be trained in the area upon which the policy is focused. Thus, it is not surprising that this variable would also be included.

The reliability coefficient corresponding to this factor was 0.8930, however this was lower than the AIR if item 5f was removed. The process of excluding items with AIR's less than the reliability coefficient underwent several iterations for this question. A new variable (Search1) was finally created using only items 5c and 5d (reliability coefficient = 0.9601).

Question 6 asked the entrepreneurs to rank the importance of several factors in the process of adapting "borrowed" solutions to Tulsa's situation. The PCA produced 4 factors which explained 84.3% of the variance. The first factor is composed of the following variables: 6b (academic papers), and 6k (public supportiveness). Reliability analysis resulted in a reliability coefficient of 0.4798, therefore no further analysis was done for this factor.

In Question 8 the entrepreneurs were asked to rate the relative importance of several variables which they have adopted based on previous experience. PCA analysis resulted in 4 factors which explained 81.05% of the variance. However, after following the rules for variable retention, only 1 factor remained. This factor is composed of the following variables: 8c (information flow), and 8d (information use). This factor clearly shows the importance of STI in the innovation/social learning process, and is composed of much the same variables as the corresponding factor in the entrepreneur survey. As shown in the case studies and outlined in the conceptual model, the role of STI in the innovation/social learning process is invaluable. Reliability analysis resulted in a reliability coefficient of 0.9088, therefore a new variable was constructed (Learn1).

Question 17 asked respondents to indicate the importance of several techniques which they learned from past policy-making experiences that they are currently applying to environmental policy decisions. The analysis produced 6 factors which explained 87.4% of the overall variance. After following the rules presented above, the first factor consisted of the following variables: 17e (accessing external information), and 17i (public participation/support). Reliability analysis resulted in a reliability coefficient of 0.7528. A new variable (Apply2) was constructed using these variables. One of the variables retained as important for this factor (17i) was also considered important by the entrepreneurs. However, taken together they are not indicative of any particular tactic which was important for the entrepreneurs.

The second factor consisted of the variable 17g (attending workshops/conferences) and 17p (networking). Once again, the important role of external information is underscored by this factor. Both conferences and networking represent opportunities in which the respondents would gain access to additional sources of STI. Reliability analysis resulted in a reliability coefficient of 0.8167, therefore a new variable (Apply5) was constructed from these variables.

3.2.2 Regression Analysis

The regression analysis was performed in order to determine if the new variables could predict response to certain survey questions. For this case, only variables which could predict the response to question 3 were considered in the regression analysis. Question 3 asked the respondents to rank the ease with which initial solutions were found and adopted. In the regression analysis the variables Probdefl and Barrier1 were both statistically significant at the 0.05 level. Probdefl had a positive correlation with question 3 (significance = 0.088), suggesting that the types of information accessed in problem definition had made finding and adopting an initial solution more difficult. Barrier1 was also positively correlated with question 3 (significance = 0.003), suggesting that the barriers which respondents found important had hindered the finding and adoption of solutions. These results are possibly reflective of the fact that no entrepreneurs have yet emerged to aid policy-makers as outlined in the conceptual model. They could also be indicative of the fact that the persons queried are not utilizing the appropriate information sources, or are not using them in the required manner.

4 Conclusions

Table 8-1 summarizes the variables which the survey participants found important, and contrasts them with those found important by the policy entrepreneurs. The survey analysis revealed many instances in which the policy elites active in the Lake Eucha debate were faced with many of the same barriers as the entrepreneurs interviewed in the case studies. Particularly important is the inadequacy of the STI available to participants. Given that many of the respondents were scientists, presumably able to access and understand a wide variety of STI sources, this finding is particularly meaningful. If the scientific community cannot access or adequately interpret STI, there is little hope that politicians and bureaucrats will find the STI useful. This underscores the need for policy entrepreneurs, who can cross institutional boundaries and tap into the knowledge of experts (political and technical), to participate in the innovation/social learning process. While both of these entrepreneurial roles appeared important in the Lake Eucha survey, it has yet to be determined whether such persons will emerge during the policy-making process.

Table 8-1. Summary of Important Variables

Process	Important Variable(s)	Important Variables(s) - Eucha
Problem Definition	Academic Journals Magazine Articles Books Specialized Workshops	Academic Journals Magazine Articles Books Specialized Workshops Other Government Agencies Internet
Barriers to Innovation	Lack of Understanding of STI Solution Required "thinking outside the box" Not Enough Time to Adequately Analyze STI Lack of Organizational Diversity Lack of Media Support Lack of Recognition Fear of Not Being Re-elected	Inadequate STI Unavailable STI Lack of Understanding of STI Lack of Timely STI Lack of Regulatory Flexibility Solution Sought too Quickly Fear of not being Reelected
		Solution Required "thinking outside the box" Difficulties Interacting with Other Agencies
Search for New Solutions	Personal Interviews with Agency Personnel Federal Government Sources Expert Opinions/Guidance	Personal Interviews with Agency Personnel Federal Government Sources
	Private Contract Service Independent Field Reports	
Adapting Borrowed Solutions	Personal Interviews with Agency Personnel Personal Experience and Opinions Expert Opinions/Guidance Private Contract Service	N/A

Ability to Learn	Information Analysis Information Flow Information Use	Information Flow Information Use
Characteristics of Learning Environment	Organizational Flexibility Development of Task Forces Public Participation/Support Use of Volunteers Community Involvement	Accessing External Information Public Participation/Support
	Accessing External Information Systems/Holistic Thinking	Attending Workshops/Conferences Networking

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Chapter 9

Conclusions and Recommendations

1 Introduction

Environmental policy makers are currently wrestling with the question of how to adapt their strategies and approaches for dealing with environmental problems toward more sustainable ends. Doing so will require the development of innovative policy measures which enable society's institutions to better cope with competing demands for its natural and human resources. The City of Tulsa, OK, has earned a reputation as a remarkably innovative government with respect to municipal environmental policies and programs. Three examples of Tulsa's innovative environmental policy are the Mingo Creek flood control program, the Metropolitan Environmental Trust, and the Ozone Alert! program.

The three environmental policy cases were innovative and adopted outside the boundaries of the traditional policy making model. Understanding the process of environmental policy innovation, and its complementary process of social learning, remains incomplete, however (Healy and Ascher 1995; Pielke 1995). The purpose of this research was to begin to fill in the gaps in understanding regarding the innovation/social learning process for environmental policy through a qualitative inquiry of the three innovative policy measures mentioned above. The study was intended to determine what factors have contributed to the city's ability to learn from its experiences.

The goal of this research was the development of a decision-making schematic for the process of policy-oriented social learning which took place in Tulsa. To build this schematic, a retrospective assessment of the process of environmental policy innovation as undertaken by the city was conducted. In addition, a policy entrepreneur survey was administered to detail the type of information entrepreneurs utilized, their perceived difficulties in the process, the factors they judged to be important in overcoming barriers to innovation, and whether or not they believed social learning had occurred.

To determine the applicability of the decision-making schematic, a somewhat shorter case study was developed documenting an emerging environmental policy issue on the policy agenda using the same methods as in the previous cases. A survey was then administered to the policy elites and technical experts active in this debate. The aim of this survey was to determine the degree to which the decision-making schematic agrees with the current decision-making paradigm operating in the city of Tulsa.

2 Decision-Making Schematic

None of the idealized representations of the innovation/social learning process found in the literature provided a good fit to the environmental policy innovations explored as part of this research. What was needed was a more generalized decision-making schematic which allows multiple points of entry in the process for scientific/technical information as well as policy entrepreneurs. As part of this research, an original decision-making schematic was developed which illustrates the pivotal role of entrepreneurs and scientific and technical information (STI) in the process.

Development of the schematic proceeded through several steps. The first step was an analysis of the idealized representations presented above for applicability to the Tulsa cases. During this analysis, both the effectiveness and shortcomings of each representation in depicting the events which took place were identified. The second step was to combine those portions of the idealized representations which effectively depicted the case studies into a working representation of Tulsa. In this first step, all possible pathways were considered. The information from the case studies was then used to eliminate pathways which did not historically occur. The schematic was then refined further through the development of new pathways for the portions of the cases which remained to be described. Finally, the roles of both policy entrepreneurs and STI as seen in the case studies were incorporated in the representation.

Following the flood events of 1976 and 1984, Tulsa city leaders were faced with a situation in which they were forced to develop the capacity to respond to flood issues. More specifically, the city's proven inability to protect the citizens forced response. The city experienced limited success with its initial efforts at floodplain management. The institutional structure following the 1976 floods was not receptive to citizens or their calls for change. However, they were effective in getting ordinances passed. Thus, they changed the institutional environment somewhat.

The discussions surrounding the implementation of these ordinances led to the development of coalitions (homeowners and developers) arguing over issues of property rights. The homeowner coalition felt that the developers were not paying the full social costs of their actions, even after the fee-in-lieu system was enacted. The developers felt that they were being unfairly burdened and not being allowed to use their own property to its highest potential. The continued arguing between coalitions is proof that old paradigms die hard, and that motivation of any alternative solutions would require a more dramatic event and an effective political coalition.

The dramatic event came in the form of the 1984 floods, which were much worse than the 1976 flood. As it happened, the seeds of an effective political coalition had recently taken office. While the overwhelming devastation forced public attention on the issue, it took political courage to effect the solutions. The personal qualities of the entrepreneurs active in this case proved to be a key ingredient in the success of Tulsa's successful innovation regarding flash flood hazard mitigation.

Another key was the ability of these individuals to utilize outside expertise, particularly scientific and technical expertise. The entrepreneurs widened their thinking by bringing in nationally recognized consultants with previous experience designing multi-purpose detention basins. They also networked with natural hazard mitigation experts such as Gilbert White and Ian McHarg. Finally, since they knew that they could not accomplish all that they wished to within the confines of the city government, they forged a highly successful partnership with the U.S. Army Corps of Engineers (COE), another source of outside expertise.

Solid waste policy innovation by Tulsa did not conform to conventional innovation models either. The policy entrepreneurs active in this case were acting in a strategic manner. Three key elements of the strategy were: (1) building partnerships with the private sector; (2) gaining a large number of participants in order to secure political buy-in; and (3) building upon successes one small step at a time.

The household hazardous waste events represent perhaps the most striking example of private-public partnerships undertaken in this case. The role played by such partnerships in the continued success of The M.e.t. has been critical. One strategy which has helped to foster such partnerships has been for The M.e.t. to remain a small organization. While the member governments are willing to lend support recycling efforts, they are not financially able to fully fund the efforts which have been undertaken. By strategically utilizing public-private partnerships, The M.e.t. has been able to supply solutions which require minimal financial investments on the part of the members. The partnership mentality dominates the relationship between The M.e.t. and the recycling public as well. This relationship has helped to both foster The M.e.t.'s reputation as the provider of environmental services and to increase the public's participation rate.

Much of the credibility of The M.e.t. is a result of the last part of their strategy, to build upon successes one small step at a time. However, strategy alone was not sufficient to build the reputation which The M.e.t. has garnished. A certain type of person is also needed in order to successfully execute the strategy. Not only does it take persons who are comfortable in the political arena, but these persons must also be able to function in the bureaucratic arena as well. In this case, Tulsa was fortunate to have had both types of persons active as entrepreneurs.

Finally, the role played by scientific and technical information in this case deserves mention. Specific technical information regarding solid waste and recycling was needed in order to educate the public and government officials about the programs The M.e.t. undertook. This information was gathered from technical journals, scientific papers, as well as waste haulers themselves. Additional information regarding the precise nature of Tulsa's waste stream was needed for decision-making. This information was not readily available to the entrepreneurs and was generated over the time period covered by this case.

In contrast to the previous two cases which were responses to actual threats, the Ozone Alert! case represented a response to a *perceived* threat for Tulsa. The threat is characterized as perceived because Tulsa was under no obligation to the EPA to reduce their ozone levels and while the community knew that redesignation would have impacts, these impacts were uncertain.

There are several aspects of the Ozone Alert! program which are key to its success. First is that it is voluntary and Tulsa's air is relatively clean. A second key to the success of the program are the successful partnerships which have been developed. Part of the reason why buy-in was readily achieved in this case is the compliance driven nature of the crisis. Had businesses and individuals not had a personal stake in keeping Tulsa's air clean, this buy-in might not have been achieved. The wish of the partners to retain their autonomy and flexibility also appears to have played a role in their buy-in. The final keys to success identified during the case study are the involvement of all levels of government, the timely incorporation of STI, and a systems approach. As in the Mingo Creek case, the intellectual contributions have mainly come from state and federal regulatory agencies.

As in the previous two cases, the city's technical capacity was limited. In this case, one limiting factor was the difficulties associated with quantifying emissions and emission reductions from mobile sources. STI was used not only to advance the modeling efforts, but also in determining the types of program changes to be implemented.

The entrepreneurs active in this case acted in a strategic manner. The circumstances they found themselves in required strategic action. Not only were there barriers present in the institutional environment which had to be overcome, but there were financial barriers as well. The reality of the political and financial situation Tulsa found itself in cultured an awareness of the limited number of opportunities it would have to change the situation. This awareness, in turn, helped the entrepreneurs to recognize windows of opportunity and act upon them.

None of the representations of innovation found in the literature review portion of this research did an adequate job of explaining the innovation/social learning process which took place in the case studies examined. As a result of the case study analysis, an original decision-making schematic of innovation was developed. The new schematic more adequately describes the processes of innovation and social learning. It makes clear the points of intervention for both policy entrepreneurs and scientific/technical information in the policy-making system, something lacking in the alternative representations.

3 Surveys

Many of the case study results and decision-making schematic's features were upheld by the survey analysis. Particularly important was the role played by scientific and technical information (STI). The inadequacy and inaccessibility of STI is a serious barrier which must be overcome for environmental policy innovation/social learning to occur. The entrepreneur plays a key role in overcoming this barrier. One important method used to overcome this barrier is to consult with experts from outside the policy-making circle. Entrepreneurs also often serve multiple roles, facilitating the flow of information and ideas between the various agencies involved in environmental decision-making.

4 Recommendations

The goal of this research was to develop a decision-making schematic for the environmental policy innovation/social learning process using the experiences of the city of Tulsa, OK. Based upon the results of this research, the following issues are recommended for further evaluation and study:

(1) Other municipal-level environmental policy innovations should be identified and evaluated. Such studies would allow for the adequacy of the decision-making schematic to be further studied.

(2) Given the differences between the policy-making process at the municipal and federal levels, it is unclear whether or not this schematic would be applicable to federal-level environmental policy innovations. Research detailing the similarities and differences between the innovation process at both levels would be useful to policy-makers.

(3) Additionally, the determination of whether the decision-making schematic is applicable to policy the innovation/social learning process in areas outside the environmental arena was beyond the scope of this research. Certainly, policy innovation occurs in all areas of public policy making. Further research into the nature of policy-making in all areas is warranted, especially an examination of the utility of the schematic for describing innovations in areas other than environmental policy.

(4) Finally, while not the focus of this study, there are different types of entrepreneurs. The entrepreneurs can be classified according to a typology presented by Roberts and King (1996). A differentiation the roles played by different types of entrepreneurs in the innovation/social learning process could be made.

Appendix A

Mingo Creek Timeline

Date	Area	Event
1964	- local -	Ian McHarg hired by Tulsa as a consultant
	- street -	Robert LaFortune was street commissioner from 1964 to 1970
1965	- engineer -	Paul W. Gulley was city engineer from 1965 to 1972
1966	- mayor -	James M. Hewgley Jr., Republican was mayor from 1966 to 1970
	- local -	Mingo watershed annexed to city
1968	- local -	Legislation was proposed that would regulate floodplains and use these areas as open-space areas
1970	- mayor -	Robert LaFortune, Republican, was mayor from 1970-1978. Joseph Coleman was street commissioner from 1970-1972
	- local -	Corps. presents report "Flood Plain Information: Mingo Creek" in March
	- Mingo -	Mother's day flood along Mingo and Joe creeks $340,000 (1994 dollars) in damages
	- local inn. -	Tulsa joined National Flood Insurance Program's emergency program, promised to adopt federal regulations
1971	- national -	NFIP issues block rate maps in August
	- local -	September: Labor Day floods: Flat Rock, Bird, and Haikey Creeks flood
	- local -	December: Bird Creek floods again
	- local inn. -	Tulsa joins "regular" NFIP program, adopted new 100-year standard, promises to regulate land use
1972	- street -	Sidney W. Patterson was street

		commissioner from 1972 to 1976
1973	- engineer -	C. Harold Miller was city engineer from 1973 to 1986
1974	- local -	April and May floods cause $2.11 million (1994 dollars) in damages along Bird Creek
	- Mingo -	Storms on June 8 cause flooding on Joe, Fry, Haikey, and Mingo Creeks. $40.24 million (1994 dollars) in damages. After this flood Tulsans for a Better Community formed to lobby for flood relief. Met at Carol William's house
	- Mingo -	September 19: Mingo floods again, third flood of year for some residents. This marks the beginning of Tulsa's "great drainage war". TBC membership grew.
	- local -	Congressman James Jones took part in public flood meetings
	- national -	The American Public Works Assn. releases a report about 100 communities w/successful detainment basins, suggests turning these into multi-purpose areas would be easy
	- local -	Bob Miller drove to Rapid City to study their floodplain acquisition program. Made a slid show of his findings and presented it to Mayor LaFortune. LaFortune told city engineers to get a consultant working on this (consultant made recommendation in 1975)
1975	- local inn.-	city engineers come up with the Mingo Creek Improvement project. The city decides to widen part of Mingo Creek and clear 33 houses
	- national -	Gilbert White publishes an article on flood hazards in the U.S. This is important, because he gave the same basic advice to Tulsa

1976	- street -	Robert Franden was street commissioner from 1976 to 1978
	- local -	James E. Goddard, floodplain consultant, submits recommendations to the city: cooperate with the Corps, implement floodplain management program, in-site detention, and adopt incentives to encourage these items (a tax adjustment would support these measures)
	- local -	Corps releases records of public meetings in April and May. Carol Williams was present, asking about combining open space areas with recreational areas, Ann Patton asked several questions, and a Mr. Sheridan put forward the idea of a flood warning/forecast system
	- Mingo -	Memorial Day flood; Mingo, Joe, and Haikey Creeks flood. 3 deaths, $75 million (1994 dollars) in damages, 3,000 buildings affected. 2 of the deaths were on Mingo Creek. Citizens gather at city hall. C. Williams now took lead in petitioning for floodplain acquisition
	- local -	TBC merged with neighborhood groups to form the Homeowners Coalition
	- local -	Corps releases "Tulsa Urban Study: Plan of Study" in August. Outlines course of study to approach problems facing Tulsa
(fall)	- local inn. -	Floodplain building moratorium enacted
	- local inn. -	Street commissioner Robert Franden hired first full-time hydrologist Charles Hardt, a former consulting engineer
	- local inn. -	Franden also hired Stan Williams as city planner, to draft city policies
	- local -	Ann Patton writes article "Will Someone Please Make Those Floods Go Away?" in

		time to remind people of the upcoming symposium. Notes that the federal government has spent $9 to $12 billion on flood control projects since 1936, but yearly damages due to floods are still $1 to $2 billion and growing
	- local inn -	Floodplain Management Symposium in Tulsa (Oct. 14-16). Speakers: Ian McHarg, Herbert Poertner ("Mr. Drainage"), James R. Jones, Don Barnett (Rapid City Mayor), Col Anthony Smith (head of the Tulsa District COE), and various others. The company J.D. Metcalfe worked for sponsored McHarg to come to Tulsa.
	- national -	Hall & Corwin publish case study of Bellevue WA
	- local -	Team One, Inc. and Flanagan and Assoc. submit report "Flood Information Study for Tulsa Metropolitan Area Planning Commission". An information gathering report. Focuses on Mingo and Joe Creeks
	- national -	Water Resources Development Act. Encourages non-federal flood control work. Work completed under way prior to federal authorization will count towards non-federal share of costs
1977	- local inn. -	Developed comprehensive floodplain management policies, regulations, and drainage criteria
	- local inn. -	Enacted stormwater detention regulations for new developments
	- local inn. -	Started an early alert warning system
	- local inn. -	Began master drainage planning for major creeks
	- local inn. -	City of Tulsa "forged a partnership" with the COE

	- local inn. -	City passed flood control bond issue
	- local -	Homeowners Coalition brought in Don Barnett who was the Rapid City Mayor during the 1972 flood. Barnett spoke to the city commission and the mayor
	- local inn. -	Special federal legislation allows Tulsa credit for reimbursement for Mingo work undertaken since 1974 - in the event that federal funding was ever approved
	- local -	Corps releases "Report on the Flood of May 30, 1976"
1978	- mayor -	James M. Inhofe, Republican, was mayor from 1978 to 1984
	- local inn. -	Tulsa adopts earth change ordinance, gives power to city over alterations to Tulsa's landscape
	- local -	Flanagan and Assoc. submit report "Public Facilities, Urban Flooding, and the Natural Land-Use Policy", encouraging land use planning and combining floodplains, urban parks, and open space to get the most out of taxpayer money
	- national -	President's Water Policy Initiative: places nonstructural techniques on equal level as structural
	- street -	J. M. Hewgley III street commissioner from 1978 to 1984
1979	- local -	Bob Miller resumed lobbying for floodplain acquisition City and Corps favored 7-10 miles of channelizations, plus 23 upstream detention basins. City commissioner Norma Eagleton listened to Miller's ideas, and had the city staff develop a proposal. This led to a plan to purchase 30 houses in the Mingo floodplain. This area was turned into a basin nicknamed "Porkchop"

1980	- national -	U.S. Dept of Interior releases "A Process for Community Flood Plain Management". This report emphasizes the fact that floodplain management is a process, not a recipe. This report goes over the process. Tulsa seems to have taken this process to heart.
(March)	- local -	Corps submits report "Mingo Creek: Interim Feasibility Study" which recommends the construction of 23 detention basins and 7.5 miles of channelization.
	- local -	Smith-Biffle-Dittrich Companies submit "Mingo Open Space/Recreation Plan" to the OK Conserv. Comm. This report had the EXACT same form as the Corps study of Mingo Creek - to facilitate the joint use of the two. Detailed how to integrate park and open space improvements with flood control programs. Very detailed document
1981	- local -	INCOG submits the "Regional Park and Recreation Plan 1980–2000" This points out that Tulsa, with lands already owned plus the purchase of low-lying areas, could satisfy the current and expected need for parks. Also, this points out that federal monies for parks have been cut off. The report points out that multiple-use facilities could still use federal money for construction
1982	- local -	Corps releases "Tulsa Urban Study Flooding Overview Report" The Corps admits in this document that detainment basins could be combined with recreational uses. The associated "Summary Report" commented on the fact that recreation land was needed, and that floodplains are good areas for recreation
1984	- mayor -	Terry Young, Democrat, was mayor from 1984 to 1986. J.D. Metcalfe was street commissioner from 1984 to 1990

	- Mingo -	Memorial Day Flood, worst Tulsa flood. 14 deaths, 288 injuries, damage to 7,000 buildings, and $257 (1994 dollars) in damages. Mingo accounted for almost 70% of the cost of damages. The current administration had only been in office for 19 days. Tulsa is now leading the nation in federally declared flood disasters (9 in 15 years)
	- local inn. -	Metcalfe and Young assembled the first Flood Hazard Mitigation Team
	- local inn.-	Hired 3 consultants: Charles Hardt (former city hydrologist) of McLaughlin Water Engineers, Stan Williams (former city planner and formerly of FEMA) a practicing attorney, and Ron Flanagan (a planning consultant)
	- local -	City Commissioners Walter Hall and Roy Gardner opposed the acquisition of flooded houses
	- local inn.-	Moratoria placed on rebuilding structures damaged by the flood
	- local inn. -	New strategy developed: relocated 300 flooded homes and a 228 pad mobile home park, $10.5 million in flood control works, and $2.1 for master drainage plans; total > $30 million
	- local -	Corps holds Mingo Creek field conference. Discusses plan 8a - 7.5 miles of channelization and 23 detainment basins. Multiple use not mentioned in report
1984-1985	- local -	Tulsans approved of $70 million in capital improvement projects to correct drainage and flooding problems
1985	- local inn. -	Department of Stormwater Management created, has centralized responsibility for all

		city flood, drainage, and stormwater programs
	- local inn. -	A new maintenance program cleaned silt and debris from major creeks and tributaries
	- local -	Corps releases report over May 27, 1984 flood. States the futility of piecemeal approach to flood control measures
1986	- mayor -	Dick Crawford, Republican, was mayor from 1986 to 1988
	- local inn. -	Stormwater utility fee established to fund the Dept. of Stormwater Management: fee exclusively for floodplain and stormwater management activities (maintenance etc.)
Sept.- Oct.	- local -	Arkansas River Flood. A levee broke, leading to around $3 million in damages. Mitigation efforts from 1984 proved successful in areas (like the mobile home park) were cited as saving the city money in this flood
	- local -	Wright Water Engineers no working with Tulsa. Several documents from this period indicate that the City Treasurer has sought the advice of Ann Patton and Stan William in allocating bond money. Also, Ann is the person that flooded Garden City residents wrote to.
1987	- engineer -	Charles Hardt was city engineer from 1987 to 1990, when he became director of Public Works.
	- local -	Association of State Floodplain Managers awards Tulsa its Local Award for Excellence
1988	- mayor -	Roger A. Randle, Democrat, was mayor from 1988 to 1992 (resigned 7/13/92)
	- national -	Flanagan submits his report "Multi-Purpose

		Planning For Greenway Corridors", prepared for EPA, FEMA, and NFIP. Quote "If flood problems could be solved in Tulsa, they could be solved anywhere".
	- local -	Wright Water Engineers holds flood management workshop in April
1990	- local -	Tulsa Public Works Department (consolidates all public services into one dept) publishes stormwater plan for the years 1990-2005
	- local -	League of Women Voters publishes their "Stormwater Study"
1991	- national -	A joint document produced by the National Park Service, the Ass. of State Floodplain Managers, and Ass. of State Wetland Managers used Mingo as an example of good planning
1992	- mayor -	Susan Savage, Democrat, served as Mayor Pro Tem, elected 8/25/92 to fill Randle's unexpired term
	- national -	Tulsa's floodplain management program given FEMA's Outstanding Public Service award
	- national -	Received nations highest rating in the National Flood Insurance Program's community rating system. Tulsa now paying lowest rates
	- national -	Association of State Floodplain Managers awards Tulsa its Local Award for Excellence
1993	- local -	Ann Patton writes "From Harm's Way"
1994	- national -	Tulsa Public Works Dept. has assembled a lengthy list of communities and nations that have been sent info on Mingo Creek projects

	- local -	Ann Patton writes "From Rooftop to River"
1995	- national -	Rita Henze talks about the success in Tulsa (and current programs to buy out flood prone houses before the next flood) at the 19th annual conference of the ASFM. Ann Patton spoke about pre-flood mitigation planning. Carol Williams presented "Acquisition One Bite at a Time: The Logical Way"

Appendix B

Municipal Solid Waste Recycling and The Metropolitan Environmental Trust Timeline

Date	Area	Event
Early '70s	- local -	Williams Brothers engineering looking at RDF (refuse derived fuel) for Urban Ore project. PSO (Public Service Co. of Oklahoma) offered $50,000 for feasibility study.
8/73	- local -	Responsibility for trash service switched from police commissioner to water and sewer commissioner. Current refuse superintendent is Tommy Neumeyer. M.R. Hall is president of independent trash haulers association.
9/73	- local -	Near records levels of complaints logged regarding trash service. (Service provided by both the city (41% of those who want service) and private haulers). Proposals discussed include mandatory bagging of trash, no rate hikes, continued landfilling (versus incineration). Refuse department losing $190,000/year.
9/73	- local -	Williams brothers engineering does a solid-waste management report for INCOG. Phase I of a 2 part study, phase II dealing with recycling was to be issued in Nov.
11/23/76	- local -	City commission considers new landfill ordinances which "strengthens control of sanitary landfills, particularly in reference to flooding, drainage, covering of wastes, pollution, and hazardous waste disposal." Also would increase penalty for violations.
11/77	- local inn.-	TERRA (Tulsa Energy Resource Recovery Authority) was formed with $400,000 start-up loan/grant from DOE. According to Les McCright TERRA was started because the city wanted an incineration plant. The city commissioners sit as the authority (it later becomes TARE {Tulsa Authority for the Recovery of Energy}).

1/13/78	- local -	Furor erupts over proposed siting of Mustang RFD Co. proposed boiler fuel-producing plant. Water and Sewer Commissioner John P. Thomas Jr. has made the plant one of the major goals of his office (he supposedly initiated the ides for the plant in 1975). Mustang is really pushing this technology in the press, using the word recycling in conjunction with it.
1/78	- local -	City looking for a new landfill site to replace the one at 81st and Union which was the subject of a district court challenge in 1977. Wagoner county site is the third site the city has considered in the past year.
3/78	- local -	Solid waste director is Phil Richmond. "Recycling" plan being pushed by Public Service Co., The Resource Sciences Center of Tulsa, and Mustang RFD Co. is to collect refuse, separate and shred it at a recycling plant, use paper, wood and other combustibles as fuel at PSC's Oologah plant to generate electricity, and recycle scrap metals.
5/78	- local -	City will run out of space at the landfill at 83rd and Union by the end of May. Two possibilities for new sites under consideration.
5/78	- local -	Mustang RFD Co. wants a site for recycling plant chosen by August 1.
5/78	- local -	Metcalfe protests the city's decision to approve "emergency" contract (versus seeking competitive bids) with BFI to use its Discount Sanitary landfill for two years while the city prepares a new site.
6/16/78	- local -	City commissioners consider a rate increase or service reduction in order to wipe out a $1.7 million operating deficit in the refuse department. Customers currently pay $3.50

		per month for three weekly pickups (two in yard, one at curb).
6/21/78	- local -	City currently paying for a lease on one landfill which is full; under contract to take trash to another which isn't licensed by the city and judged substandard by the City-County Health Department; prepared a contract to buy land for a third landfill; and looking at a possible location for a fourth.
6/30/78	- local inn.-	City commissioners adopt a new ordinance regulating refuse collectors. It specifies that city's license number be painted on all refuse trucks, lowers license fees, requires rates to be posted when applying for license, and limits pickup hours.
11/7/78	- local -	TERRA gives approval for engineering and cost estimates for the first of two transfer stations which would be needed as part of Mustang RDF Co. proposal.
11/19/78	- local -	Gordian Associates Inc. recommended that Tulsa proceed with the recycling system to convert trash to fuel. They said the technology was sound but the city must take steps to assure that there is plenty of trash available to make the plan economically feasible (250,000 tons/yr). First talk of flow control.
7/79	- local -	TARE asked for proposal for a five-year residential waste collection contract. Originally was bid for 25% of the city, but Tulsa Refuse Inc. (TRI) was actually awarded 75% of the city.
1980	- local -	AES approaches the city with a letter of intent from Sun Refining and wants to build a Waste to Energy (WTE) plant.
1983	- local -	Ogden Martin gets involved in the incineration talks, wanting to utilize Martin Gmbh technology.

12/1/83	- local -	TARE approves a contract with Alternate Energy Systems (AES) in March 1982 that specifies construction begin by the end of the year. Feb, 1983 extension granted until Dec 83 because of banker's problems with the contract, commissioners denied the extension.
		Officials released feasibility report by HDR Techserv, Inc. (Omaha NE consulting firm) which says the facility can work as designed; the obligations are within the demonstrated technical capabilities of the respective parties; the plant can be built with the money being raised; the annual revenue and expense projections are based on reasonable technical assumptions; all major permits have been issued; the 30-month schedule is adequate; the facility will have a 'useful life extending beyond' the final maturity of the bonds; the proposed site is a good location; enough waste is available to make the project profitable' projected revenues are adequate to operate and maintain the facility, make debt service payments and maintain a reserve fund and a maintenance fund.
12/30/83	- local -	Commissioners granted a 1 month extension to AES for beginning construction. City agrees to assume more risks in order to obtain financing. This includes increasing the amount of trash to be delivered annually as well as monthly quotas.
4/84	- local inn.-	TARE board members give the WTE plant project the OK. Within three months, bonds were issued, contracts and permits renewed, and construction began.
1985	- local inn.-	Regional Solid Waste Management Advisory Committee formed as part of INCOG
2/3/86	- local -	Patty Eaton (Water and sewer

		commissioner) takes over supervision of trash-to-energy plant from finance and revenue (Walter B. Hall was finance and revenue commissioner, Gary Watts is now). They are considering permanently moving refuse to water and sewer. {It was moved to finance and revenue in 1980}.
		WTE plant to be fired up for tests at the end of the month.
1988	- local inn.-	Liberty Glass and the Tulsa World begin to sponsor the "Get Off Your Glass - Recycle" campaign, with collection bells located throughout the city. For every ton of glass collected, Liberty Glass contributes $20 to United Way.
1/30/88	- local inn.-	Northeast Oklahoma Solid Waste Management Authority (NOSWMA) to be formed in February by nine communities. Purpose is to locate, finance and construct a joint landfill.
3/88	- local inn.-	City initiates CRABS (no mention of what acronym stands for) commercial billing system which bills commercial customers for waste disposal on their water bill. Rates are based on type of business and square footage of space. This was started in an effort to keep private haulers from disposing of trash at cheaper landfills instead of the WTE plant.
6/88	- local -	City is to raise residential rates ($.37 for twice a week, $.51 for backyard service and $.65 for extra service).
		TARE approve an agreement with Ogden Martin to pay 90% of the costs for legal arbitration of a contract dispute between Ogden Martin and Sun Refining. Dispute about whether to pay for steam based on regulated or deregulated price of natural gas.

6/88	- local inn.-	Owasso's city owned recycling center opens. It pays for recyclable items. It also serves as a refuse center, charging much less than landfills for people to dump their trash. The city then hauls the trash to landfills.
8/88	- local inn.-	City of Tulsa passes an ordinance requiring all trash generated inside the city to be taken to the WTE plant. NOSWMA Trust Indenture officiated
4/1/89	- local inn. (Low generator rate-	City raises trash rates again. {twice weekly went from $9.77 to $12.63, backyard service went from $12.67 to $15.53, extra service from $15.57 to $18.43, city service from $8.50 to $9.90}. Also a special "low trash generators" class started, those who use less than 2,000 gallons of water in 3 months of the year qualify. All of this is based on the doubling of tipping fees from $21 to $42/ton at the WTE plant. These are the largest rate hikes in history, all to keep the trash reserve fund from running out of money. (Tulsa Refuse Inc. volunteered to forego a 4% rate increase for the second year in a row).
4/89	- local -	A citizens Solid Waste Advisory Board was named to review all facets of the WTE plant. They are to examine the possibility of purchasing the plant, altering the contract with Tulsa Refuse to once-a-week pickup, consider creating new residential classifications, and alternatives to the CRABS billing system. Long range studies of regional solid waste disposal solutions and the integration of recycling into the system are also to be performed.
5/89	- local -	Ogden Martin sues the city for failure to reimburse the company for sales and ad valorem taxes. The city is operating according to a legal opinion which says it cannot reimburse the money.

5/7/89	- local inn.-	American Waste Control is operating Tulsa Transfer and Recycling Station (a material recovery facility (MRF) of sorts) where it separates recyclables from its commercial refuse prior to disposal at the WTE plant.
6/89	- local -	Overhead Door Co sues the city over CRABS, claiming it is a tax which is being assessed without a vote of the citizens.
8/89	- local -	May and June revenue from trash was enough to cover operating costs for the WTE plant for the first time since it began operations.
10/89	- local inn. -	Project ReDirectory started as an idea by Tulsa school children. Went national the next year.
12/89	- local inn.-	Solid Waste Management Department, Tulsa county and NOSWMA sponsor first weekend collection of used motor oil and automotive batteries.
12/89	- local -	Goodwill Industries in Tulsa begins accepting newspaper and aluminum for recycling.
12/89	-local/national -	Newspaper glut has reduced the price paid for used newsprint by about half.
1/26/90	- local -	WTE plant reporting a $1.3 million loss for the first six months of the fiscal year. Revenues from CRABS are lower than projected following many adjustments. Ogden Martin also billed for a whole year at once instead of spreading it out.
1/30/90	- local -	Chamber of Commerce forms a task force to examine CRABS billing system. Solid Waste Department is working with a University of Tulsa professor to revise the CRABS system.
2/90	- local -	Susan Young wrote "Tulsa County Used

		Motor Oil and Lead-Acid Battery Collection Event" report to get money from the Dept. of Health and PSO.
		NOSWMA started event-based bulky waste program
2/1/90	- local -	BA city officials begin to study possibility of recycling.
2/16/90	- state -	Special House Interim Committee on Solid Waste Disposal and Recycling recommends increased recycling and source reduction in Oklahoma.
2/22/90	- local -	City Solid Waste Management Department recommends a 10% increase in trash rates ($46 tipping fees) in its preliminary budget proposal in order to keep trash operations from operating at a deficit.
3/90	- local -	Solid waste moved to Public Works department (Charles Hardt in charge).
3/20/90	- local -	Randle asks for meeting with Ogden Martin to discuss renegotiation of the operations contract for the WTE plant. Ogden Martin says they won't meet until the tax payback matter is resolved.
3/21/90	- local inn.-	Owasso city officials passed waste disposal regulations requiring grass, leaves and trees to be separated from other trash and placed in biodegradable bags (available for purchase from the city). The project is set up as a year-long experiment.
4/90	- local -	The city of Bixby and NOSWMA begin sponsoring a recycling drive to benefit the cities parks system. Containers will be placed for collection of aluminum and glass. They will also sponsor a one-day event to collect bulky waste which will be separated into metal and non-metal waste (first time done in OK).

4/90	- local -	NOSWMA becomes The M.E.T.
5/8/90	- local -	Rodger Randle appoints Bob Dick to work on the WTE plant. He is to coordinate efforts to solve the trash problem with the Public Works Dept., Dept. of Finance and the Chamber of Commerce task force. Dick says he will look at the whole picture, including recycling. (Reports issued in 7/90)
6/90	- local inn.-	M.E.T. produces first regional recycling directory (updated bi-yearly) – public education tool
7/90	- local -	Antifreeze is added to the hazardous waste collections (along with oil and batteries). The M.E.T. publishes areas first comprehensive directory of recycling centers in the Tulsa area.
7/16/90	- local -	Bob Dick releases his report on the WTE plant. He recommends that the city contract out the trash service it has been providing, renegotiating the contract with TRI, and implementing a citywide recycling program. Randle supports recycling if it can be done with no cost increase to customers. The M.E.T. seeks a grant to fund a regional recycling center {a MRF} and staffing it with jail inmates.
8/90	- local -	City officials ask Ogden Martin for a proposal for recycling household waste. Randle says he wants the city to consider proposals from many sources. Ogden says that their contract allows them to reduce the guarantee or trash to take into account recycling.
8/1/90	- local -	City attorney's office releases an opinion that the contract with TRI was not bid according to state competitive bidding laws and appears to be void. Suggests letting the

		District Court decide whether it is valid or should be rebid.
8/22/90	- local -	Tulsa city officials begin studying recycling programs in cities across the country, looking at how they may adapt them to work in Tulsa.
8/30/90	- local -	District judge rules that the city of Tulsa must pay the property taxes agreed upon in the Ogden Martin contract.
9/1/90	- state -	State law goes into effect which imposes a $.25/month fee on trash bills collected by cities. The money will be split between the cities and the state Health Dept.. The law allows cities that reduce the amount of trash taken to landfills to have a proportional reduction in the fee - a progressive way to encourage recycling and composting activities.
10/12/90	- local -	City reaches a tentative settlement agreement regarding the class action lawsuit against CRABS. The city agrees to begin a new billing system by 2/1/91 and the class will receive no refunds.
10/12/90	- local -	Tulsa's only plastic recycler (American Recycling) closes.
		The M.E.T., Business & Industry Recycling Program (BIRP), and Oklahoma State Dept. of Health sponsor a 2-day recycling conference in Tulsa.
10/31/90	- local -	Survey indicates 84% of Tulsans favor voluntary recycling, and about half as many favor mandatory recycling.
11/21/90	- local -	City council appoints a citizens committee to study recycling in Tulsa. Susan Young will serve as advisor.
12/8/90	- local -	Solid Waste Division report released

		comparing three types of recycling programs in 13 cities and counties.
11/22/90	- local -	Pilot neighborhood curbside recycling project begins in Forest Creek subdivision. Project is brainchild of a local homeowner and a trash hauler.
12/13/90	- local -	Resource Recovery Systems Inc. proposes operation of a dirty MRF outside the WTE plant. TRI opposes it, they want curbside recycling.
2/91	- local -	M.E.T. finishes study on Herbicide/Pesticide program
2/1/91	- local -	New commercial billing ordinance which bills according to size of trash container and frequency of pick up goes into effect. TARE (now a citizen's advisory committee) will monitor the system and make recommendations for changes after 6 months.
2/3/91	- local -	Pride in Tulsa holds its first drive-through recycling fair. Collects newspaper, plastic, glass and aluminum.
2/21/91	- local -	BA officials visit a MRF in South Dakota as part of their search for a recycling program.
3/21/91	- local -	Owasso makes composting plan permanent. The pilot program alone reduced their landfill waste by 25%.
4/1/91	- local -	The M.E.T. adds household batteries to its household hazardous waste collection efforts.
4/2/91	- local -	BA starts a "Don't Bag It" campaign modeled against a Texas program. 20 demonstration homes will receive free mulching mowers and fertilizer for a year. Any interested party can receive free instruction.

5/29/91	- local -	The M.E.T. chooses CH2M Hill to perform a regional recycling study to evaluate recycling alternatives and identify potential markets for recyclable materials.
7/12/91	- local -	Phillips Co. announces it plans to open a plastics recycling plant in Tulsa by November.
10/17/91	- local -	Citizens Recycling Advisory Committee releases its final report to the city council. The plan calls for three phases of recycling programs, each followed by an evaluation of participation and affordability. First phase involves three to four drop-off centers. Nine to 12 months later, a pilot curbside program would be established. It could then be expanded citywide, with mixed recyclables placed in color coded bags.
11/91	- local -	Susan Young leaves M.E.T. for Minneapolis. (Ms. Domin of INCOG serves as interim director until 2/92)
12/91	- local -	Recycle America ends its collection of newspapers due to the losses they were experiencing (up to $6000/month).
1/30/92	- local -	Phillips Plastics Recycling Partnership opens Oklahoma's first plastics recycling center, creating a market for recycled plastics.
		Rodger Randle announces that the city will not seek a court ruling on the validity of its contract with TRI.
2/92	- local -	Roger Miner becomes executive director of The M.E.T.
4/3/92	- local -	Tulsa hires its first recycling coordinator (Michael Patton). His primary missions are education and studying possible recycling programs for the city.

5/28/92	- local innovation-	The M.E.T. takes its oil, antifreeze, and battery recycling on the road to Bixby in its new recycling trailer.
5/30/92	- local -	The M.E.T. proposes building a permanent collection/recycling center at Expo Square. It would at first collect oil, antifreeze and batteries, but then expand into a recycling buy-back center.
6/92	- local -	City and TRI argue over proposed rate freeze for several months. City wants rate to stay frozen until they match OKC's and then use the same formula OKC uses to figure rates. TRI wants a three year freeze if the city also agrees not to take the contract to court.
		The M.E.T. looked into a permanent facility for its Oil and Battery program. Decided to keep it on the road to access outlying communities.
7/92	- local -	TRI contract automatically hikes rates $.19/month. City does not pass cost on to customers. TRI puts the money in a trust fund until the contract changes can be worked out.
9/92	- local -	CH2M Hill Solid Waste Characterization and Waste Reduction/Recycling Study finished for The M.E.T.
		Implementation Task Force was formed to plan a recycling program based on CH2M Hill report. Its goals were to reduce the waste stream, prevent pollution, educate the public, and create jobs.
9/7/92	- local -	A private recycling firm wants to offer curbside pickup for Tulsa residents, but was told it would be illegal as the trash belongs to the city and only TRI can pick it up.
9/11/92	- local	Mayor Savage signs an executive order

	innovation-	stating that the city will give preference to recycled paper when bids are no more than 20% above regular paper prices. Such purchase require city council approval. (The state already requires use of recycled paper in state offices).
9/15/92	- national -	More than 20 national companies (including McDonald's, American Airlines, and Sears) launch a campaign designed to create demand for recycled goods.
9/23/92	- local -	Tulsa city councilors working on a new ordinance that will allow private curbside recyclers to pick up in the city. Many points to be worked out. The final ordinance is to be ready in early 93.
10/92	- local -	City paid $200,000 to landfill 15,000 tons of excess trash in the fiscal year ending 7/92. This was trash above the capacity of the WTE plant. The excess causes long lines for trucks waiting to dump at the plant. Several people suggest this money could be spent on recycling efforts.
10/28/92	- local -	Waste Management of Oklahoma announces it will open a recycling buy-back center in late Nov. or early Dec. The center will accept paper (many types), cardboard, glass, nos 1 ad 2 plastic, aluminum cans, carpet pads.
11/8/92	- local innovation-	M.E.T. study recommends a regional approach to recycling with Tulsa acting as an anchor for area drop-off centers. The study shows that a yard waste reduction program would have a bigger impact on the waste stream than recycling.
11/19/92	- local innovation -	Mayor Savage backs a plan to include household hazardous waste at proposed recycling drop-off centers.
12/4/92	- local -	M.E.T. communities approve drop-off

		center plans.
12/15/92	- state -	State Health Department officials estimate that more than half of the state's 110 landfill will close under new federal regulations slated to take effect 10/9/93.
2/19/93	- local -	City council approves funding for Tulsa's portion of the M.E.T. recycling stations.
4/93	- local innovation-	First M.E.T. center opens in the Holiday Hills shopping center. (First portable recycling drop-off center in the state). The centers use specially designed trailers which are divided into compartments and can be hauled by a pickup truck. M.E.T. sponsors a motor oil, battery, and antifreeze collection event. This is scheduled to be the last collection event.
5/6/93	- local innovation?-	City kicks off its first "Grasscycling" campaign.
5/18/93	- local -	City and TRI now arguing over who will accept complaint calls under the renegotiated contract. City wants to accept all calls in order to monitor TRI as that's their only way out of the contract. TRI thinks the city is looking for a way to nail them to the wall.
6/9/93	- local -	M.E.T. plans to add information centers to its drop-of centers as their attendants are spending too much time answering questions.
7/1/93	- local -	City still has no contract with TRI approved, triggering automatic rate hikes. City plans to absorb them once again. Contract negotiations have been going on for 18 months.
7/7/93	- local -	Jenks changes its residential refuse collection system. Will phase in rollaway

		carts, limited yard waste pickup (with a Don't Bag It/Grasscycling program), and city billing. (Trickling down of some of the local innovations from other M.E.T. cities).
7/25/93	- local innovation -	City of Tulsa and The M.E.T. sponsor "7 Days Not to Waste" campaign as a formal kick-off to the drop-off centers. Includes demonstrations about how to prepare materials for recycling, a series of newspaper articles, discussions about earth-friendly alternatives for the house and garden, environmentally friendly shopping advice, grasscycling and composting demonstrations, and landfill tours.
7/28/93	- local -	Jenks recycling drop-off center opens.
9/22/93	- local -	Bixby drop-off center opens.
10/1/93	- national -	EPA gives landfills that take under 100 tons of city garbage per day a 6 month extension to meet new regulations. This should allow most cities time to find solutions to the closing of many landfills.
10/21/93	- national -	Clinton signs an executive order revamping the government's procurement policy, requiring the use of environmentally friendly products, mostly paper, oil and tires.
10/30/93	- local innovation -	Tulsa holds the state's first collection of old pesticides, paint and other types of household hazardous chemicals.
11/93	- local -	Restaurant and Bar glass program studied, M.E.T. board voted not to pursue this program.
1/28/94	- local -	Initial figures show the M.E.T. centers are costing 6 times as much to operate as they are bringing in from the sale of recyclables.

2/23/94	- local -	Bixby collection center bringing in much less recyclables than expected, forcing the city to increase its supplemental funding. All cities needed to provide supplemental funding for their centers, with the amount based on the shortage of materials and revenues at each site.
2/25/94	- local -	Tulsa and TRI finally reach agreement on a contract. The new contract amendment entitles TRI to a rate increase every three years, based on the Consumer Price Index.
5/94	- national -	The Supreme Court rules that ash produced at municipal waste incinerators will not be automatically exempt from hazardous waste regulations. So far, Tulsa's ash has never tested hazardous. In another case, the Supreme Court strikes down flow control ordinances, saying they restrict free trade. This isn't expected to affect Tulsa because of the way their commercial billing is done.
7/94	- local -	Tulsa gets a chance to use its new chipper to chip debris from a storm and offer free mulch to the public.
9/24/94	- local -	Cerad industries opens a paper recycling facility in Tulsa. This increases the types of paper which can be accepted for recycling in the local area.
10/94	- national -	Scrap metal prices begin to rebound after several years of being very low.
11/94	- local -	Gaylon Pinc named as interim director of the M.E.T.
1/95	- local -	Michael Patton becomes head of The M.E.T.
1/29/95	- national -	Increased demand for scrap paper has increased the price dramatically.

6/21/95	- local -	Broken Arrow recycling center begins accepting used motor oil.
7/95	- national -	Used newspaper prices have gone so high that there is a thriving trade in stolen newspaper.
10/18/95	- national -	A national marketplace for buying and selling recyclable trash opened at the Chicago Board of Trade.
10/26/95	- local innovation -	M.E.T. begins giving away used paint collected at its household pollutant collection events.
2/21/96	- national -	The Supreme Court lets stand contractual flow control provisions. In such provisions, cities only award garbage-hauling contracts to companies that agree to deliver trash to the government designated facility.
3/15/96	- national -	New EPA regulations will require that all WTE plants attain the same emissions as the top 12% nationally. (Controls to be in place by Dec. 19, 2000). New controls could cost as much as $30 million. The city has until December 1997 to notify the EPA whether it plans to upgrade the incinerator or to close it. These regulations were challenged by a Utah incinerator.
3/27/96	- local -	Some M.E.T. recycling centers begin accepting steel cans.
8/29/96	- local -	HDR Engineering Inc. report estimates it will cost approximately $132.2 million to add pollution control equipment and continue to operate the WTE plant for the next 10 years. They estimate the cost of closing the plant, paying off Ogden Martin and landfilling at $133.9 million. The landfilling option would reduce estimated landfill capacity from 44 years to 16 years.
11/21/96	- local -	TARE decides to accept bids for the

		disposal of the city's residential trash stream.
2/27/97	- local -	City opens bids for landfilling. Waste Management was the low bidder with a price quote 27% lower than the estimate in the HDR report (disposal at the quarry landfill).
3/14/97	- local -	Phillips plastic recycling plant celebrates its fifth anniversary (opened 2/92).
4/23/97	- local -	M.E.T. told that they have to move their recycling center at 21st and Yale ASAP.
6/4/97	- local innovation -	M.E.T. recycling centers begin accepting eyeglasses in conjunction with the Lions Club.
6/7/97	- local -	City and Ogden-Martin officials have been negotiating over the retrofit of the WTE plant to meet the new clean air regulations. The city has offered to pay Ogden-Martin $12.47 per ton (the amount Waste Management will landfill for under a 25 year contract) to dispose of the waste and allow them to keep all profits from steam sales and residual materials.
11/3/97	- local -	Ogden-Martin offers to pay for the retrofit, but asks the city for an up-front payment of $18 million, saying it is financial recognition for the risk-shifting by the city. City admits it may not be able to get out of the current contract with Ogden-Martin, thus may not be able to landfill.
1/29/98	- local -	TARE signs a 20-year landfill contract with Waste Management. The new contract is for excess waste which is not burned at the WTE facility. It has a lower tipping fee than the city has been paying, but allows for annual adjustments based on the CPI. It also gives the city the option to take all of its trash to the landfill should the city decide in

		2007 not to renew its contract for the WTE plant.
2/10/98	- local -	Projected 1999 city budget increases trash rates by 7%. Similar increases are projected for 2001, 2002, and 2003. Increases are to be used to offset the cost of the retrofit.
3/19/98	- local -	TARE forms a committee to study recycling options in the city of Tulsa. The committee has said it will give serious consideration to a curbside program.
6/4/98	- local innovation -	M.E.T. kicks off its "Barrels Behind Bars" bottle recycling program. The bars must separate trash into clear, green, and brown but it is picked up for free. Smithey Environmental services picks up the glass. Funding was provided by the M.E.T. in the form of a grant to Smithey Environmental.
6/13/98	- local -	New city councilor Anna Falling comes out against the proposed trash rate hike, saying she is banking on U.S. Rep. Steve Largent's ability to delay the EPA mandate. (Construction is supposed to begin by the end of 1998 on the retrofit).
7/28/98	- local -	Anna Falling claims that if the city were to implement mandatory recycling they would be able to buy cheaper air pollution control equipment. This would require getting a deadline waiver from the EPA. Falling will not support a recycling plan which increases trash rates. She also refuses to release details of her plan until the city council and mayor agree to support it.
8/7/98	- local -	City council approves the 7% trash rate increase, to take effect in October. They also approved Falling's request to ask the state's congressional delegation for help in obtaining either a delay or financial help with the retrofit.

8/19/98	- local -	Falling distributes a newsletter to her constituents which may contain misleading or inaccurate information regarding recycling and the WTE plant.
9/24/98	- local -	City asks Ogden-Martin to stop burning non-city waste at the WTE plant. It is questioning the environmental ramifications - they may be burning hazardous stuff. Ogden-martin agrees.
9/24/98	- local -	Phillips announces it is closing its plastic recycling center. It cites lack of product as a major contributor to the decision.
9/25/98	- local -	City refuses to pay a bill Ogden-Martin submitted for preliminary retrofit work. It questions the validity of many of the charges and claims they were double billed for others.

Appendix C

Ozone Alert! Timeline

Date	Area	Event
1971	-national-	EPA issues standard for photochemical oxidants of 0.08 ppm as a one-hour average, not to be exceeded more than once in any given year.
5/1/77	- local -	Tulsa area air quality below EPA standards
7-9/77	- local -	An EPA sponsored air quality and meteorological measurement study took place. A photochemical modeling study was also conducted.
1977	- local -	states required by Congress to revise SIPs to demonstrate that the NAAQS would be attained by 12/31/82
1977	- national-	CAA Amendments
2/2/78	- local -	INCOG volunteers to do clean air planning for region
2/18/78	- local -	Mayor LaFortune states during a Tulsa City Commission that the air problem has to be addressed
2/24/78	- national-	EPA releases report on nation's air quality, OK has five problem areas
5/10/78	- state -	meeting of state Air Quality Council, plans for Tulsa opposed by oil and agriculture representatives
6/78	- national-	EPA and DOT release "Transportation-Air Quality Planning Guidelines"
10/13/78	- local -	no air plan agreed on, plan due at EPA Jan 1
4/79	- local -	TMAPC completes "Mobile and Area Source Emissions Inventory for Tulsa, Oklahoma" for the EPA
1979	- national-	(EPA) photochemical oxidant standard revised to address ozone, established a

		standard of 0.12 ppm, not to be exceeded more than once a year: Cleveland county now attainment, Oklahoma and Tulsa counties still nonattainment
1979	- local -	23 ozone exceedances on 8 days
1979-1980	- state -	37th state legislature passes "Oklahoma Ridesharing Act"
3/3/80	- local -	EPA releases 18 traffic control measures for cities to consider under the CAA. Tulsa looked at pertinent items
6/80	- local -	INCOG comes up with a range of transportation control measures to consider
7/10/80	- local -	INCOG presents a seminar, "Clearing the Air" at Tulsa City-County Library
9/16/80	- local -	meeting of Transportation/Air Quality Public Advisory Subcommittee
1980	- local -	two-year vehicle occupancy study finished
1980	- local -	Transportation/ Air Quality Subcommittee potential members listed- see file
1980	- local -	30 exceedances on 9 days
1980s	- local -	Tulsa classified as nonattainment for ozone
7/1/81	- local -	"transportation Control Measures" completed around this date, discusses ways to improve public transportation. Kevin Landergan of MTTA and Jerry Howell of INCOG involved
7/14/81	- local -	Transportation/Air Quality Citizen's Advisory Committee meeting
1981	- national-	CAA up for reauthorization
1981	- local -	11 exceedances on 4 days

1982	- local -	8 exceedances on 5 days
3/83	- local -	preliminary version of "Evaluation of Transportation Control Measures" ready for evaluaiton (prepared by INCOG)
6/83	- local -	"Analysis and Evaluaiton of Population Consistency" completed by INCOG, a metropolitan Tulsa area transportation study, a modified version of a similar report done in 7/82
6/23/8	- national-	EPA Administrator William D. Ruckelshaus speaks at the Annual Convention of Air Pollution Control Association, presented clean air policy
11/15/83	- local -	Tulsa given another year to meet ozone standards
1983	- local -	7 exceedances on 4 days (as of 7/31)
1/18/84	- local -	Metropolitan Tulsa Chamber of Commerce responds to John Drake's request and supports a recommendation to establish statewide anti-tampering emissions control legislation
9/18/84	- local -	OK State Air Quality Council met in Tulsa- Tulsa County only non-attainment county in OK. Discussed SIP.
1984	- local -	an emissions inventory was performed
1984-5	- local -	Sites 191 and 110 in Tulsa monitored hydrocarbon levels.
1985	- local -	one ozone exceedance
1985	- local -	OTAG (Ozone Transport Assessment Group) performed an emissions inventory for photochemical grid modelling
1985	- local -	the emissions inventory data from 1984 and data from a 1985 photochemical modeling

		study were used to formulate the SIP revision.
7/85	- local -	Washington State University performed hydrocarbon and ozone sampling by means of aircraft.
6/24/86	- local -	ozone exceedance
7/25/86	- local -	exceedance
7/28/86	- local -	ozone exceedance
4/11/87	- local -	Tulsa has no new air plan for EPA approval
3/10/88	- local -	INCOG releases comments on the EPA's "Proposed Strategy for Post-1987 Ozone Nonattainment". Sent to EPA on 3/15.
5/88	- state -	Air Quality Service of the Okla State Dept. of Health releases "Demonstrating Attainment of the Ozone Standard in Tulsa County"
5/6/88	- local -	INCOG comments on the proposal by the Ad-Hoc clean air group
6/3/88	- local -	"Major Changes and Clarifications in the Proposal by Members of the Ad-Hoc Clean Air Group on Ozone and Carbon Monoxide Nonattainment" released
7/7/88	- local -	INCOG comments on EPA's proposed rulemaking regarding SIPs and attainment
7/14/88	- local -	Tulsa City-County Environmental Advisory Council meeting, John Drake presents "Oklahoma's Nonattainment and the Clean Air Act"
8/9/88	- state -	OSDH submits "Evaluation Report for the Tulsa County, Oklahoma Ozone Redesignation Request"

8/12/88	- regional-	EPA Region VI receives state's request to redesignate Tulsa as attainment. Request was denied.
8/24/88	- local -	ozone exceedance
9/9/88	- local -	ozone exceedance
9/14/88	- local -	Dave Cox in communication with Jerry Lasker, Rich Brierre, Irving Frank, and Tom Kane about EPA sited deficiencies
12/20/88	- local -	"Effectiveness of Air Pollution Control Programs in the Tulsa Metropolitan Area" released by INCOG
1988	- local -	an oil field emission study was performed in the areas of crude oil production around Tulsa.
3/22/89	- local -	Mark Coleman sends memo to OSDH Ad Hoc Committee of Clean Air Act Revisions. Subject: OSDH recommendations and comments to H.R. 99
3/23/89	- national-	101st Congress releases a Legislative Update of Clean Air Bills
4/5/89	- local -	Mark Coleman sends memo to Ad Hoc Comm., recommends further review of CAA changes, wants meeting 4/28
4/18/89	- local -	John Drake, Chief, Air Quality Service, sends memo to OSDH Ad Hoc Comm. about meeting on 4/28. Includes summary of proposed CAA revisions
4/21/89	- local -	Dave Cox sends his agency's reactions to John Drake
5/8/89	- local -	Mark Coleman sends a memo to the Ad Hoc Comm. about the status of the CAAA review: includes opinions of comm. with regards to recommendations

7/5/89	- local -	ozone exceedance
8/2/89	- local -	INCOG releases an Air Quality Update
8/17/89	- local -	OSDH Ad Hoc Committee Meeting. Mark S. Coleman, Deputy Commissioner for Environmental Health Services present. Topic: proposed CAA amendments. Decides EPA will stall about approving/disproving the SIP until the CAA Amendments are passed. "We have a limited window of opportunity in which to act" [to get Tulsa declared attainment] (memo from INCOG).
8/18/89	- local -	INCOG Air Qual Ad Hoc Cmty meeting
8/23/89	- national-	Mark Coleman meets w/ EPA officials and The National Governors Association Clean Air Task Force about CAA amendments
8/30/89	- local -	Memo from Mark Coleman to Ad Hoc Comm., schedules next meeting, wants to discuss clean air act amendments
9/5/89	- local -	INCOG Air Quality Ad Hoc Committee meeting. Dealt with Tulsa air quality issues, Michael D. Graves absent.
9/7/89	- local -	OSDH Ad Hoc Committee Meeting
9/7/89	- national-	Tulsa's disapproved request for attainment redesignation printed in Federal Register
9/19/89	- local -	OSDH Ad Hoc Committee releases "Specific Comments to the Administration CAA Proposal" DRAFT
9/21/89	- local -	INCOG Air Qual Ad Hoc Cmty meeting
9/21-2/89	- local -	EPA Region 6 develops guidance on source specific RACT, holds conference call with headquarters
9/25/89	- local -	send to headquarters (OAQPS & OMS)

		draft of specific guidance from Region 6
9/26/89	- local -	headquarters reviews recommendations
9/28/89	- local -	headquarters hold conference call w/EPA, finalize guidance
10/2/89	- local -	EPA meets with Oklahoma Air Quality Service
10/3/89	- local -	Oklahoma Council Meeting, state and EPA reps present
10/11/89	- local -	Ad Hoc Committee meeting. Members: Jerry Cleveland, Ray Bishop, Larry Byrum, Jim Price, Clyde Cole, Jerry Lasker, dave Cox, Lee Paden
10/12/89	- local -	Lasker writes to Thomas H. Diggs, EPA, about the EPA proposed designation of Tulsa as non-attainment.
10/16/89	- local -	state provides final position on VOC SIP call issues discussed on 10/2
10/18/89	- local -	Drake writes Jerry Lasker, thanking him for the data and statistics submitted by Lasker's staff, which became a large part of the proposals of control strategies, and in showing Tulsa was in attainment
10/19/89	- local -	INCOG Air Quality Ad Hoc Cmty meeting. present: John Drake, Larry Byrum, Bob Curtis, Jim Zink, Larry Pool, Dave Bradshaw, Don Phillips, Mel Rice, Jim Price, Jerry Lasker, Dave Cox, Bill Breisch(sp?), Forrest Miller, Gene Siddall, Larry Potts, Bob Dick, Dave Blankenship
11/21/89	- local -	INCOG Air Quality Ad Hoc Committee meeting
1989	- local -	Ad Hoc Committee on Clean Air Act Revisions: Larry Byrum, OSDH; David Dyke, OCC; John Sharp, ACOG; Bruce

		Ball,OEJ/OCAWG; David Branecky, OG&E; Jim Wilson, OG&E; Tom Kane, INCOG; John Drake, OSDH-AQS; Richard Hess, OEJ/OCAWG; Jules Kubri, OSCCI; Frank McGilbra, PSO
1/22/90	- local -	INCOG releases comments on S. 1630 to amend the federal CAA
2/27/90	- local -	Gov. Bellmon receives fax from EPA, they will propose to place Tulsa in attainment
3/8/90	- local -	INCOG releases comments on H. R. 3030 to amend the federal CAA, INCOG AQC meeting
7/20/90	- local -	Sierra Club releases report on improved Oklahoma air quality
7/23/90	- local -	INCOG Air Quality Committee adopted the Ozone Alert program during the meeting this day
8/31/90	- local -	two ozone exceedances
8/90	- local -	Tulsa considering switching 25 county vehicles to natural gas
1990	- local -	INCOG facilitated a working group with the function of providing data to EPA and ODEQ to document achievement with ozone NAAQS (from G. Pinc)
1990	- national-	Clean Air Act Amendments were passed
11/90	- local -	Tulsa was redesignated as attainment for ozone
6/24/91	- local -	Tulsa exceeded the NAAQS limit forozone at two sites, one more exceedance and they are off the clean-air list
7/11/91	- local -	INCOG AQC meeting
7/23/91	-loc. inn.-	INCOG creates Air Quality Committee,

		(earlier) organizes the *Ozone Alert!* program on this day, plan unveiled by Randle and John Selph, County Commissioner
7/25/91	- local -	Tulsa's two refineries announce they will participate and sell lower vp gas
7/27/91	- local -	EPA happy w/ Tulsa plan
7/30/91	-loc. inn.-	Roger Randle kicks off commuting program by not driving his '71 Chevelle during the Ozone Alert! Ray Bishop (City-County Health Dept.) called the Ozone Alert
8/1/91	- local -	all 4,000 Tulsa employees ride buses free for the rest of summer
8/11/91	- local -	gasoline retailers join in clean air program
8/26/91	- local -	ozone alert day
8/91	- local -	Lydia Chiu of the Tulsa City-County Health Department writes "Ozone Reduction in Tulsa County From Mobile Sources"
11/13/91	- local -	INCOG AQC meeting
12/18/91	- local -	INCOG AQC meeting
1991	- local -	a total of 4 Ozone Alerts! were called, two exceedences
2/13/92	- local -	INCOG AQC special meeting
4/5/92	- local -	Lasker and Selph meet with William G. Roswenberg (Assistant Administrator USEPA) and C. Boyden Gray (Counsel to the President) to discuss air program
5/19/92	- local -	Dave Cox reminds INCOG employees about Rideshare and Mass Transit programs
6/11/92	- local -	INCOG Air Quality Committee consisted of: Jerry Lasker, Michael Graves, Richard Hedgecock, Bill Breisch, Jerry Cleveland,

		Mark Prichard, Dave Cox, Jim Doherty. Special meeting on this date.
6/19/92	- local -	ozone alert day declared
7/12/92	-loc. inn.-	MERIT trading program developed
1992	- local -	4 ozone alert days declared, no exceedences
1/20/93	- local -	Tulsa targets lawn equipment on ozone alert days; reps from Longview, TX in Tulsa to learn how to cut air problems. Programs in OKC and Evanston, IL already modelled on Tulsa
3/24/93	- national-	The Public Transit Innovation Journal named the MERIT system "most innovative metropolitan planning organized sponsored program" second year in a row
5/9/93	- local -	local refineries unwilling to provide reduced vp gas
5/13/93	- local -	gas suppliers agree to lower vp to 8.5, would not lower to requested 7.8
6/19/93	- local -	mobile testing lab made available to major area employers to test vehicle emissions, city plans to purchase 10 alternative fule commuter vans
7/10/93	-loc. inn.-	Thumbs Up program kicked off- stations with low vp fuel get thumb poster
7/21/93	- local -	ozone alert day
7/28/93	- local -	ozone alert day
7/29/93	- local -	ozone alert day
7/30/93	- local -	ozone alert day
8/13/93	- local -	ozone exceedance, first since 6/24/91

8/18/93	- local -	Tulsa hosts National Conference of Mayors, gets to brag later about ozone
8/20/93	- local -	ozone alert day, eighth this month
8/21/93	- local -	rare weekend ozone alert issued
11/3/93	- local -	INCOG (Lasker) wants better inspection program for vehicles and emissions
1993	- local -	ten ozone alerts called, one exceedance (not on an ozone alert day)
1/22/94	- state -	stricter emissions regulations proposed by Rep. Larry Rice. Focuses on tailpipe exhaust
2/8/94	-loc. inn.-	contest to develop slogan and phrase for ozone alert held
2/25/94	- local -	winners announced: Johnny King won best logo, Colette Breyland won best slogan. Won $300 and $200, respectively
4/22/94	- local -	ozone alert season kicked off one month early due to warm weather
5/15/94	- local -	"try transit week"- wear something green and ride bus for free
6/20/94	- local -	first ozone alert day of the year
6/21/94	- local -	ozone alert, ozone exceedance
6/22/94	- local -	ozone exceedance
6/24/94	- local -	meeting with city and county leaders to discuss further voluntary measures
6/29/94	- local -	ozone alert day, fourth of year
7/7/94	- local -	refineries lowering vp to 8.0 (Sun) and 8.2 (Sinclair)
	- local -	Conoco drops vp to 8.0

7/8/94		
7/10/94	- local -	INCOG sponsors an automobile emissions study, performed by the Remote Sensing Institute of the University of Denver
7/24/94	- local -	article in Tulsa World lists cities that used Tulsa as a blueprint for their clean air programs
9/8/94	- local -	Ray Bishop quits, claims philosophical differences, angry about investigation into refinery releases
1994	- local -	four ozone alerts, three exceedances
6/21/95	- local -	ozone alert day
6/22/95	- local -	ozone alert day
8/22/95	-loc. inn.-	Mayor Savage and EPA Assistant Administrator Mary Nichols sign the FAR.
8/25/95	- local -	ozone alert, ozone exceedance
8/27/95	- local -	Sunday ozone exceedance, highest since 1984
8/28/95	- local -	ozone alert
8/29/95	- local -	ozone alert
8/30/95	- local -	ozone alert
9/95	- national-	Mayors meeting in Seattle, Savage brags about FAR and partnership with EPA
10/11/95	- local -	ozone alert, a rare occurrence in autumn
4/22/96	- local -	Tulsa officials remind businesses about the upcoming ozone season. Tulsa now notifying over 300 businesses on ozone days. Many businesses reward employees for carpooling

6/13/96	- local -	ozone alert
7/2/96	- local -	ozone exceedance, no ozone alert issued
7/3/96	- local -	ozone alert
11/27/96	- national-	EPA proposes stricter air regulations
12/4/96	- national-	Inhofe named chairman of subcommittee that oversees clean air issues, part of the Senate Committee on Public Works
12/10/96	- local -	MTTA toying with idea of cancelling free bus rides on ozone days
6/23-8/98	- national-	Glenn Travis, Hilary Kitz, and Heather Turner prepare the paper "Innovations in Ozone Control: Flexible Attainment Region and the Voluntary, Episodic Ozone Alert! Program" to be presented at the Air & Waste Management Association annual meeting
6/25/97	- national-	Clinton approves tougher air regulations
11/97	- local -	The Air Study Partnership presents the report "An Assessment of the Current Knowledge of Ozone Air Pollution in the Tulsa Metropolitan Area" to INCOG (Air Study Partnership = Ed Gibeau, Aeromet Inc [Tulsa]; Kit Wagner, Atmospheric Information Systems [Norman]; and Dan Wilson, Wilson Consulting Group [Tulsa])
spring 98	- local -	"slow down and sweat" program to discourage morning use of air conditioners in autos
7/15/98	- local -	ozone alert day, first of season
7/17/98	- local -	ozone alert
7/25/98	- local -	ozone exceedance, no alert
8/1/98	- local -	ozone exceedance

8/20/98	- local -	ozone exceedance
8/21/98	- local -	ozone exceedance (fourth violation of year)
8/22/98	- local -	ozone alert, Saturday
9/1/98	- local -	ozone alert, ozone exceedance
9/2/98	- local -	ozone alert
9/3/98	- local -	ozone exceedance
9/4/98	- local -	ozone alert, ozone exceedance
9/5/98	- local -	ozone alert, ozone exceedance (Saturday)
9/6/98	- local -	ozone alert, ozone exceedance (Sunday)
9/7/98	- local -	ozone alert

Appendix D

Policy Entrpreneur Survey

Strategic Policy Innovation Project

POLICY ENTREPRENEUR SURVEY

Prepared By

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April 2000

Supported by National Science Foundation grant SBR-9618003, "Strategic Policy Innovation and Social Learning: Flood Hazard Mitigation, Recycling, and Air Quality in Tulsa, OK"

Thank-you in advance for completing my survey. I have left the following two pages blank in order for you to provide additional comments if you desire. If you have any questions regarding this survey, please contact me at 405-325-2290.

Becky Ziebro

Name ______________________

The questions below deal with three significant cases of environmental policy change and innovation in the City of Tulsa. For the purposes of this survey, a policy innovation is defined as "**a program or practice which is new to the implementing institution, and which is evidenced by a change in standard operating practices"**
(e.g., detention ponds).

Please check the case with which you are most familiar and to which your answers below will correspond.

- ☐ Flash flooding hazard mitigation along Mingo Creek
- ☐ Solid Waste Recycling and The Metropolitan Environmental Trust
- ☐ Air Quality and the Ozone Alert! program

Approximately how many different policy innovations are you familiar with in the case you checked above? _____

For the case you checked above, please answer the following questions (#1-4) for any 3 policy innovations with which you are most familiar, indicating the innovation you are referencing:

A. Innovation #1 (Please Describe) ______________________________

____

1A. When you became aware that you had a problem which required a response, what information did you utilize to specify the exact nature of the problem, and how important was each type?

Please circle a number indicating the relative importance of the following, using the scale shown at the right.	Very Important 1	2	Somewhat Important 3	4	Not Important 5	Did not Access 6
a. Obtained information from academic journals	1	2	3	4	5	6
b. Obtained information from magazine article	1	2	3	4	5	6
c. Obtained information from newspaper articles	1	2	3	4	5	6
d. Obtained information from books	1	2	3	4	5	6
e. Had discussions with experts	1	2	3	4	5	6
f. Attended specialized workshops	1	2	3	4	5	6
g. Obtained information from government agencies other than my own (if applicable).	1	2	3	4	5	6
h. Obtained information from within my own government agency (if applicable).	1	2	3	4	5	6
i. Internet Research	1	2	3	4	5	6

2A. How quickly did you become familiar with the problem (please check one)?

- ☐ One-two months
- ☐ Two-six months
- ☐ More than a year
- ☐ Still learning
- ☐ Six months to a year

3A. Once the nature of the problem was determined, how would you characterize the ease with which an *initial* solution was found and adopted?

5 Easily found and adopted (please skip question #4 for this innovation)
6 Easily found, had difficulties adopting
7 Difficult to find, had to design new solutions

4A. Of the following possible reasons for difficulties encountered while adopting the chosen solution, please circle a number indicating their relative importance, using the scale shown at right.

	Very Important		Somewhat Important		Not Important	Did not Access
	1	2	3	4	5	6
a. Inadequate scientific/technical information	1	2	3	4	5	6
b. Unavailable scientific/technical information	1	2	3	4	5	6
c. Lack of understanding of scientific/technical information	1	2	3	4	5	6
d. Lack of timely scientific/technical information	1	2	3	4	5	6
e. Too costly	1	2	3	4	5	6
f. Funding mechanism unavailable	1	2	3	4	5	6
g. Solution required "thinking outside the box"	1	2	3	4	5	6
h. City of Tulsa bureaucratic structure unable to accommodate solution	1	2	3	4	5	6
i. Not acceptable to politicians	1	2	3	4	5	6
j. Not acceptable to public	1	2	3	4	5	6
k. Risk of failure	1	2	3	4	5	6
l. Lack of regulatory flexibility	1	2	3	4	5	6
m. Not enough time to adequately analyze scientific/technical information	1	2	3	4	5	6
n. Encountered difficulties interacting with other agencies/levels of government	1	2	3	4	5	6
o. Lack of organizational diversity	1	2	3	4	5	6
p. Solution sought too quickly	1	2	3	4	5	6
q. Solution sought too slowly	1	2	3	4	5	6
r. Lack of media support	1	2	3	4	5	6
s. Lack of recognition	1	2	3	4	5	6
t. Fear of not being re-elected	1	2	3	4	5	6

B. Innovation #2 ______________________________

1B. When you became aware that you had a problem which required a response, what information did you utilize to specify the exact nature of the problem, and how important was each type?

Please circle a number indicating the relative importance of the following, using the scale shown at the right.

	Very Important		Somewhat Important		Not Important	Did not Access
	1	2	3	4	5	6
a. Obtained information from academic journals	1	2	3	4	5	6
b. Obtained information from magazine articles	1	2	3	4	5	6
c. Obtained information from newspaper articles	1	2	3	4	5	6
d. Obtained information from books	1	2	3	4	5	6
e. Had discussions with experts	1	2	3	4	5	6
f. Attended specialized workshops	1	2	3	4	5	6
g. Obtained information from government agencies other than my own (if applicable).	1	2	3	4	5	6
h. Obtained information from within my own government agency (if applicable).	1	2	3	4	5	6
i. Internet Research	1	2	3	4	5	6

2B. How quickly did you become familiar with the problem (please check one)?

- ☐ One-two months
- ☐ Two-six months
- ☐ Six months to a year
- ☐ More than a year
- ☐ Still learning

3B. Once the nature of the problem was determined, how would you characterize the ease with which an *initial* solution was found and adopted?

1. Easily found and adopted (please skip question #4 for this innovation)
2. Easily found, had difficulties adopting
3. Difficult to find, had to design new solutions

4B. Of the following possible reasons for difficulties encountered while adopting the chosen solution, please circle a number indicating their relative importance, using the scale shown below.

	Very Important 1	2	Somewhat Important 3	4	Not Important 5	Did not Access 6
a. Inadequate scientific/technical information	1	2	3	4	5	6
b. Unavailable scientific/technical information	1	2	3	4	5	6
c. Lack of understanding of scientific/technical information	1	2	3	4	5	6
d. Lack of timely scientific/technical information	1	2	3	4	5	6
e. Too costly	1	2	3	4	5	6
f. Funding mechanism unavailable	1	2	3	4	5	6
g. Solution required "thinking outside the box"	1	2	3	4	5	6
h. City of Tulsa bureaucratic structure unable to accommodate solution	1	2	3	4	5	6
i. Not acceptable to politicians	1	2	3	4	5	6
j. Not acceptable to public	1	2	3	4	5	6
k. Risk of failure	1	2	3	4	5	6
l. Lack of regulatory flexibility	1	2	3	4	5	6
m. Not enough time to adequately analyze scientific/technical information	1	2	3	4	5	6
n. Encountered difficulties interacting with other agencies/levels of government	1	2	3	4	5	6
o. Lack of organizational diversity	1	2	3	4	5	6
p. Solution sought too quickly	1	2	3	4	5	6
q. Solution sought too slowly	1	2	3	4	5	6
r. Lack of media support	1	2	3	4	5	6
s. Lack of recognition	1	2	3	4	5	6
t. Fear of not being re-elected	1	2	3	4	5	6

C. Innovation #3 ______________________________

1C. When you became aware that you had a problem which required a response, what information did you utilize to specify the exact nature of the problem, and how important was each type?

Please circle a number indicating the relative importance of the following, using the scale shown at the right.

	1 Very Important	2	3 Somewhat Important	4	5 Not Important	6 Did not Access
a. Obtained information from academic journals	1	2	3	4	5	6
b. Obtained information from magazine articles	1	2	3	4	5	6
c. Obtained information from newspaper articles	1	2	3	4	5	6
d. Obtained information from books	1	2	3	4	5	6
e. Had discussions with experts	1	2	3	4	5	6
f. Attended specialized workshops	1	2	3	4	5	6
g. Obtained information from government agencies other than my own (if applicable).	1	2	3	4	5	6
h. Obtained information from within my own government agency (if applicable).	1	2	3	4	5	6
i. Internet Research	1	2	3	4	5	6

2C. How quickly did you become familiar with the problem (please check one)?

- ☐ One-two months
- ☐ Two-six months
- ☐ Six months to a year
- ☐ More than a year
- ☐ Still learning

3C. Once the nature of the problem was determined, how would you characterize the ease with which an *initial* solution was found and adopted?

1. Easily found and adopted (please skip question #4 for this innovation)
2. Easily found, had difficulties adopting
3. Difficult to find, had to design new solutions

4C. Of the following possible reasons for difficulties encountered while adopting the chosen solution, please circle a number indicating their relative importance, using the scale shown below.

	Very Important		Somewhat Important		Not Important	Did not Access
	1	2	3	4	5	6
a. Inadequate scientific/technical information	1	2	3	4	5	6
b. Unavailable scientific/technical information	1	2	3	4	5	6
c. Lack of understanding of scientific/technical information	1	2	3	4	5	6
d. Lack of timely scientific/technical information	1	2	3	4	5	6
e. Too costly	1	2	3	4	5	6
f. Funding mechanism unavailable	1	2	3	4	5	6
g. Solution required "thinking outside the box"	1	2	3	4	5	6
h. City of Tulsa bureaucratic structure unable to accommodate solution	1	2	3	4	5	6
i. Not acceptable to politicians	1	2	3	4	5	6
j. Not acceptable to public	1	2	3	4	5	6
k. Risk of failure	1	2	3	4	5	6
l. Lack of regulatory flexibility	1	2	3	4	5	6
m. Not enough time to adequately analyze scientific/technical information	1	2	3	4	5	6
n. Encountered difficulties interacting with other agencies/levels of government	1	2	3	4	5	6
o. Lack of organizational diversity	1	2	3	4	5	6
p. Solution sought too quickly	1	2	3	4	5	6
q. Solution sought too slowly	1	2	3	4	5	6
r. Lack of media support	1	2	3	4	5	6
s. Lack of recognition	1	2	3	4	5	6
t. Fear of not being re-elected	1	2	3	4	5	6

If you wish to answer questions #1-4 for more than 3 innovations, please feel free to do so. For the remainder of the survey, however, please refer to the whole case you marked at the beginning when answering questions.

5. Using the scale presented below, what was the relative importance of the following sources of information in the search for new solutions.

	Very Important		Somewhat Important		Not Important	Did not Access
	1	2	3	4	5	6
a. Academic papers	1	2	3	4	5	6
b. Personal interviews with academics	1	2	3	4	5	6
c. Personal interviews with agency personnel	1	2	3	4	5	6
d. Federal government sources	1	2	3	4	5	6
e. State government sources	1	2	3	4	5	6
f. Personal experience and opinions	1	2	3	4	5	6
g. Expert opinions/guidance	1	2	3	4	5	6
h. Private contract service	1	2	3	4	5	6
i. Independent field reports	1	2	3	4	5	6
j. Identified similar problem and solution elsewhere	1	2	3	4	5	6
k. Internet resources	1	2	3	4	5	6

6. For solutions which were "borrowed" from another location with a similar problem, please rank the relative importance of the following in adaptation of the solution to Tulsa's problem. (Use the scale presented below. If no solutions were borrowed, please go to question #7)

	Very Important		Somewhat Important		Not Important	Did not Access
a. No adaptation occurred, solution was adopted as it was found (Go to question #7)	1	2	3	4	5	6
b. Academic papers	1	2	3	4	5	6
c. Personal interviews with academics	1	2	3	4	5	6
d. Personal interviews with agency personnel	1	2	3	4	5	6
e. Federal government sources	1	2	3	4	5	6
f. State government sources	1	2	3	4	5	6
g. Personal experience and opinions	1	2	3	4	5	6
h. Expert opinions/guidance	1	2	3	4	5	6
i. Private contract service	1	2	3	4	5	6
j. Independent field reports	1	2	3	4	5	6
k. Public supportiveness	1	2	3	4	5	6

7. In your experience with policy innovation, how important did you find the following factors to be? Please rate using the scale at right.

Very Important		Somewhat Important		Not Important	Did not Access
1	2	3	4	5	6

a. Cooperation between many agencies and/or levels of government	1	2	3	4	5	6
b. Volunteers	1	2	3	4	5	6
c. User fees and market-like approaches	1	2	3	4	5	6
d. Flow of information and individuals across organizational boundaries	1	2	3	4	5	6
e. Flow of information and individuals across bureaucratic and political boundaries	1	2	3	4	5	6
f. Planning and analysis as key aspects	1	2	3	4	5	6
g. Public support	1	2	3	4	5	6

8. Do you think the City of Tulsa has learned from past experience with environmental policy innovations?

☐ Yes ☐ No

If yes, how important were each of the following factors have enabled the city to continue to learn? Please use the scale at right.

Very Important		Somewhat Important		Not Important	Did not Access
1	2	3	4	5	6

a. Information analysis	1	2	3	4	5	6
b. Information access	1	2	3	4	5	6
c. Information flow	1	2	3	4	5	6
d. Information use	1	2	3	4	5	6
e. Flexible organizational structure	1	2	3	4	5	6
f. Holistic programs	1	2	3	4	5	6
g. Networking	1	2	3	4	5	6
h. Ad-hoc task forces	1	2	3	4	5	6
i. Leadership	1	2	3	4	5	6

9. How important, in your experience, do you think public support was in the ultimate success of the policy innovation?	1	2	3	4	5	6

(Please circle the correct number using the scale above)

10. If you felt public support was important, please indicate, using the scale above, the importance of each of the following factors in motivating public support.

a. Political coalitions	1	2	3	4	5	6
b. Voluntary associations	1	2	3	4	5	6
c. Public awareness/education	1	2	3	4	5	6
d. Political demands on decision makers	1	2	3	4	5	6

Very Important		Somewhat Important		Not Important	Did not Access
1	2	3	4	5	6

11. How important, in your opinion, was private sector participation/activities in the ultimate success of the policy innovation? (Please circle the correct number using the scale above)   1 2 3 4 5 6

12. If you felt private sector participation was important, please indicate the importance of each of the following activities using the scale above.

a. Providing publicity	1	2	3	4	5	6
b. Providing resources	1	2	3	4	5	6
c. Providing program piloting/demonstrations	1	2	3	4	5	6
d. Other (specify) ______________________	1	2	3	4	5	6

____

13. How important in determining the course of policy outcomes were the courts? (Please use the scale above)   1 2 3 4 5 6

14. If you felt the courts were important, please rank the importance of the following activities, using the scale above.

a. Clarification of ambiguous statutes	1	2	3	4	5	6
b. Deriving legitimacy for new ideas	1	2	3	4	5	6

15. How important in motivating policy innovation was the City Council (or City Commission)?   1 2 3 4 5 6

16. If you felt the City Council (or Commission) was important, please rank the importance of the following activities (please use the scale presented above).

a. Development of study committees	1	2	3	4	5	6
b. Proclamations/statutes/ordinances	1	2	3	4	5	6
c. Public hearings/meetings	1	2	3	4	5	6

17. What techniques/approaches did you learn from you involvement with the policy innovation that you are using now when confronted with environmental policy questions? (Please check all that apply and indicate their relative importance, using the scale at right)

	Very Important 1	2	Somewhat Important 3	4	Not Important 5	Did not Access 6
☐ Organizational flexibility	1	2	3	4	5	6
☐ Development of task forces	1	2	3	4	5	6
☐ Scanning to determine how other municipalities have dealt with similar issues	1	2	3	4	5	6
☐ Recruitment of technical expertise	1	2	3	4	5	6
☐ Accessing external information	1	2	3	4	5	6
☐ Discussions with experts	1	2	3	4	5	6
☐ Attending workshops/conferences	1	2	3	4	5	6
☐ Unique funding mechanisms	1	2	3	4	5	6
☐ Public participation/support	1	2	3	4	5	6
☐ Don't fear failure	1	2	3	4	5	6
☐ Don't accept failure	1	2	3	4	5	6
☐ Intergovernmental interactions	1	2	3	4	5	6
☐ Use of volunteers	1	2	3	4	5	6
☐ Single individuals serving in multiple roles	1	2	3	4	5	6
☐ Planning and analysis	1	2	3	4	5	6
☐ Systems/holistic thinking	1	2	3	4	5	6
☐ Networking	1	2	3	4	5	6
☐ Community involvement	1	2	3	4	5	6
☐ Crisis can motivate change	1	2	3	4	5	6
☐ Other (please specify)________________	1	2	3	4	5	6

____

____

Appendix E

SPSS Results for Policy Entrepreneur Survey

Factor Analysis Question 1

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.010	33.450	33.450	3.010	33.450	33.450
2	1.648	18.306	51.756	1.648	18.306	51.756
3	1.259	13.991	65.747	1.259	13.991	65.747
4	1.081	12.015	77.762	1.081	12.015	77.762
5	.581	6.452	84.214			
6	.499	5.541	89.754			
7	.374	4.157	93.911			
8	.340	3.776	97.687			
9	.208	2.313	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix

	Component			
	1	2	3	4
ONE_A	.633			
ONE_B	.803			
ONE_C	.601	-.614		
ONE_D	.723			
ONE_E	.541			.509
ONE_F	.824			
ONE_G		.570		.507
ONE_H			.740	
ONE_I		.673		

Extraction Method: Principal Component Analysis.
a. 4 components extracted.

Reliability first component question 1

*** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S - S C A L E (A L P H A)

		Mean	Std Dev	Cases
1.	ONE_A	1.6271	1.3633	59.0
2.	ONE_B	1.9492	1.3949	59.0
3.	ONE_D	2.0678	1.4126	59.0
4.	ONE_F	3.3390	1.6040	59.0

Covariance Matrix

	ONE_A	ONE_B	ONE_D	ONE_F
ONE_A	1.8586			
ONE_B	.8083	1.9456		
ONE_D	1.1981	.9173	1.9953	
ONE_F	.8355	1.2072	1.0111	2.5728

Correlation Matrix

	ONE_A	ONE_B	ONE_D	ONE_F
ONE_A	1.0000			
ONE_B	.4251	1.0000		
ONE_D	.6222	.4656	1.0000	
ONE_F	.3821	.5396	.4463	1.0000

N of Cases = 59.0

Statistics for	Mean	Variance	Std Dev	N of Variables
Scale	8.9831	20.3273	4.5086	4

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
ONE_A	7.3559	12.7849	.5830	.4139	.7358
ONE_B	7.0339	12.5161	.5943	.3684	.7298
ONE_D	6.9153	12.0789	.6369	.4562	.7081
ONE_F	5.6441	11.6470	.5579	.3435	.7531

R E L I A B I L I T Y   A N A L Y S I S - S C A L E (A L P H A)

Reliability Coefficients   4 items

Alpha = .7842   Standardized item alpha = .7870

Factor Analysis Question 4

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.030	25.149	25.149	5.030	25.149	25.149
2	3.513	17.565	42.714	3.513	17.565	42.714
3	1.723	8.613	51.327	1.723	8.613	51.327
4	1.687	8.434	59.761	1.687	8.434	59.761
5	1.324	6.620	66.381	1.324	6.620	66.381
6	1.170	5.849	72.230	1.170	5.849	72.230
7	.983	4.913	77.143			
8	.807	4.033	81.176			
9	.697	3.483	84.659			
10	.659	3.297	87.956			
11	.480	2.401	90.357			
12	.413	2.065	92.422			
13	.349	1.746	94.168			
14	.282	1.408	95.576			
15	.253	1.267	96.843			
16	.194	.970	97.813			
17	.158	.792	98.605			
18	.124	.618	99.223			
19	8.638E-02	.432	99.655			
20	6.899E-02	.345	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix

	Component					
	1	2	3	4	5	6
FOUR_A		.776				
FOUR_B		.656				
FOUR_C	.585					
FOUR_D	.549	.710				
FOUR_E		-.555				
FOUR_F						
FOUR_G	.595					
FOUR_H	.542	-.550				
FOUR_I						
FOUR_J				.577		
FOUR_K				.581		
FOUR_L					.546	
FOUR_M	.510					
FOUR_N					.620	
FOUR_O	.703					
FOUR_P						
FOUR_Q					-.511	
FOUR_R	.624					
FOUR_S	.533					
FOUR_T	.611					

Extraction Method: Principal Component Analysis.

a. 6 components extracted.

Reliability (1st component question 4)

**** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	FOUR_C	2.7455	1.4810	55.0
2.	FOUR_G	4.3273	.8401	55.0
3.	FOUR_M	2.3636	1.4576	55.0
4.	FOUR_O	2.1818	1.4918	55.0
5.	FOUR_R	1.7818	1.1171	55.0
6.	FOUR_S	1.9818	1.3122	55.0
7.	FOUR_T	1.4727	1.3724	55.0

Covariance Matrix

	FOUR_C	FOUR_G	FOUR_M	FOUR_O	FOUR_R
FOUR_C	2.1933				
FOUR_G	.2515	.7057			
FOUR_M	1.4091	.1195	2.1246		
FOUR_O	.6582	.4394	.4141	2.2256	
FOUR_R	.2953	.3875	.1919	.8737	1.2478
FOUR_S	.1434	.2098	.4882	.4108	.5515
FOUR_T	.4003	.3609	.6027	1.0791	.7532

	FOUR_S	FOUR_T
FOUR_S	1.7219	
FOUR_T	.5273	1.8835

Correlation Matrix

	FOUR_C	FOUR_G	FOUR_M	FOUR_O	FOUR_R
FOUR_C	1.0000				
FOUR_G	.2022	1.0000			
FOUR_M	.6528	.0976	1.0000		
FOUR_O	.2979	.3506	.1905	1.0000	
FOUR_R	.1785	.4130	.1179	.5243	1.0000
FOUR_S	.0738	.1903	.2553	.2098	.3763
FOUR_T	.1970	.3131	.3013	.5271	.4913

	FOUR_S	FOUR_T
FOUR_S	1.0000	
FOUR_T	.2928	1.0000

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

N of Cases = 55.0

Statistics for	Mean	Variance	Std Dev	N of Variables
Scale	16.8545	33.2377	5.7652	7

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
FOUR_C	14.1091	24.7286	.4288	.4963	.7191
FOUR_G	12.5273	28.9946	.3910	.2160	.7283
FOUR_M	14.4909	24.6620	.4456	.5140	.7145
FOUR_O	14.6727	23.2613	.5386	.4125	.6905
FOUR_R	15.0727	25.8835	.5372	.4331	.6968
FOUR_S	14.8727	26.8539	.3428	.2210	.7361
FOUR_T	15.3818	23.9071	.5549	.4028	.6871

Reliability Coefficients 7 items

Alpha = .7419 Standardized item alpha = .7480

Reliability

*** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y A N A L Y S I S - S C A L E (A L P H A)

		Mean	Std Dev	Cases
1.	FOUR_J	2.5714	1.3465	56.0
2.	FOUR_K	2.4643	1.5488	56.0

Covariance Matrix

	FOUR_J	FOUR_K
FOUR_J	1.8130	
FOUR_K	.8026	2.3987

Correlation Matrix

	FOUR_J	FOUR_K
FOUR_J	1.0000	
FOUR_K	.3849	1.0000

N of Cases = 56.0

Statistics for	Mean	Variance	Std Dev	N of Variables
Scale	5.0357	5.8169	2.4118	2

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
FOUR_J	2.4643	2.3987	.3849	.1481	.
FOUR_K	2.5714	1.8130	.3849	.1481	.

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Reliability Coefficients   2 items

Alpha = .5519   Standardized item alpha = .5558

Factor Analysis question 5

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.938	26.709	26.709	2.938	26.709	26.709
2	2.148	19.532	46.241	2.148	19.532	46.241
3	1.577	14.339	60.580	1.577	14.339	60.580
4	1.160	10.542	71.121	1.160	10.542	71.121
5	1.111	10.095	81.217	1.111	10.095	81.217
6	.603	5.480	86.697			
7	.539	4.899	91.596			
8	.470	4.274	95.869			
9	.265	2.410	98.280			
10	.125	1.140	99.419			
11	6.386E-02	.581	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix

	Component				
	1	2	3	4	5
FIVE_A			.814		
FIVE_B	.502		.512		
FIVE_C	.829				
FIVE_D	.769				
FIVE_E	.512	.624			
FIVE_F					
FIVE_G	.751				
FIVE_H		-.682			
FIVE_I		-.621			
FIVE_J			.639		-.578
FIVE_K				.574	

Extraction Method: Principal Component Analysis.
a. 5 components extracted.

Reliability

*** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	FIVE_C	3.6957	1.2590	23.0
2.	FIVE_D	4.2174	.8505	23.0
3.	FIVE_G	4.3913	.8913	23.0

Covariance Matrix

	FIVE_C	FIVE_D	FIVE_G
FIVE_C	1.5850		
FIVE_D	.7964	.7233	
FIVE_G	.4427	.2747	.7945

Correlation Matrix

	FIVE_C	FIVE_D	FIVE_G
FIVE_C	1.0000		
FIVE_D	.7438	1.0000	
FIVE_G	.3945	.3624	1.0000

N of Cases = 23.0

Statistics for	Mean	Variance	Std Dev	N of Variables
Scale	12.3043	6.1304	2.4760	3

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
FIVE_C	8.6087	2.0672	.6846	.5713	.5315
FIVE_D	8.0870	3.2648	.6970	.5589	.5424
FIVE_G	7.9130	3.9012	.4075	.1663	.8166

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Reliability Coefficients   3 items

Alpha = .7408   Standardized item alpha = .7502

Reliability

*** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	FIVE_H	2.7826	1.6502	23.0
2.	FIVE_I	2.9565	1.6090	23.0

Covariance Matrix

	FIVE_H	FIVE_I
FIVE_H	2.7233	
FIVE_I	1.6265	2.5889

Correlation Matrix

	FIVE_H	FIVE_I
FIVE_H	1.0000	
FIVE_I	.6125	1.0000

N of Cases = 23.0

Statistics for	Mean	Variance	Std Dev	N of Variables
Scale	5.7391	8.5652	2.9266	2

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
FIVE_H	2.9565	2.5889	.6125	.3752	.
FIVE_I	2.7826	2.7233	.6125	.3752	.

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Reliability Coefficients   2 items

Alpha =   .7596   Standardized item alpha =   .7597

Factor Analysis Question 6

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.657	46.570	46.570	4.657	46.570	46.570
2	1.756	17.558	64.128	1.756	17.558	64.128
3	1.522	15.217	79.346	1.522	15.217	79.346
4	.756	7.558	86.904			
5	.463	4.629	91.532			
6	.384	3.839	95.372			
7	.221	2.214	97.586			
8	.182	1.817	99.403			
9	4.051E-02	.405	99.808			
10	1.920E-02	.192	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix

	Component		
	1	2	3
SIX_B		.789	
SIX_C	.634	.621	
SIX_D	.883		
SIX_E	.777	.528	
SIX_F	.634		-.578
SIX_G	.677		
SIX_H	.733		
SIX_I	.705		
SIX_J	.518		.826
SIX_K	.842		

Extraction Method: Principal Component An
a. 3 components extracted.

Reliability

*** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	SIX_D	3.4615	1.4500	13.0
2.	SIX_G	3.5385	1.2659	13.0
3.	SIX_H	4.3077	.8549	13.0
4.	SIX_K	4.1538	1.3445	13.0
5.	SIX_I	3.0769	1.6053	13.0

Covariance Matrix

	SIX_D	SIX_G	SIX_H	SIX_K	SIX_I
SIX_D	2.1026				
SIX_G	.9808	1.6026			
SIX_H	.5128	.5705	.7308		
SIX_K	1.4231	.6603	.6987	1.8077	
SIX_I	1.1282	.8718	.8077	1.4872	2.5769

Correlation Matrix

	SIX_D	SIX_G	SIX_H	SIX_K	SIX_I
SIX_D	1.0000				
SIX_G	.5343	1.0000			
SIX_H	.4137	.5272	1.0000		
SIX_K	.7299	.3879	.6079	1.0000	
SIX_I	.4847	.4290	.5886	.6890	1.0000

N of Cases =   13.0

Statistics for	Mean	Variance	Std Dev	N of Variables
Scale	18.5385	27.1026	5.2060	5

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
SIX_D	15.0769	16.9103	.6784	.6361	.8036
SIX_G	15.0000	19.3333	.5539	.4525	.8355
SIX_H	14.2308	21.1923	.6581	.5224	.8244
SIX_K	14.3846	16.7564	.7757	.7345	.7753
SIX_I	15.4615	15.9359	.6702	.5348	.8109

Reliability Coefficients   5 items
Alpha = .8432   Standardized item alpha = .8540

Factor Analysis Question 8

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.580	39.775	39.775	3.580	39.775	39.775
2	1.817	20.185	59.960	1.817	20.185	59.960
3	1.333	14.808	74.768	1.333	14.808	74.763
4	.978	10.869	85.637			
5	.702	7.802	93.439			
6	.268	2.983	96.422			
7	.158	1.750	98.172			
8	.124	1.381	99.553			
9	4.027E-02	.447	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix

	Component		
	1	2	3
EIGHT_A	.820		
EIGHT_B	.706	-.610	
EIGHT_C	.852		
EIGHT_D	.700		
EIGHT_E	.544	.627	
EIGHT_F	.525		.694
EIGHT_G			
EIGHT_H	.589	-.588	
EIGHT_I			

Extraction Method: Principal Component An

a. 3 components extracted.

Reliability

*** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	EIGHT_A	4.1818	.8528	22.0
2.	EIGHT_C	4.4091	.8541	22.0
3.	EIGHT_D	4.2727	.8827	22.0

Covariance Matrix

	EIGHT_A	EIGHT_C	EIGHT_D
EIGHT_A	.7273		
EIGHT_C	.3983	.7294	
EIGHT_D	.5195	.4545	.7792

Correlation Matrix

	EIGHT_A	EIGHT_C	EIGHT_D
EIGHT_A	1.0000		
EIGHT_C	.5468	1.0000	
EIGHT_D	.6901	.6029	1.0000

N of Cases = 22.0

Statistics for	Mean	Variance	Std Dev	N of Variables
Scale	12.8636	4.9805	2.2317	3

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
EIGHT_A	8.6818	2.4177	.6921	.5031	.7520
EIGHT_C	8.4545	2.5455	.6259	.3961	.8163
EIGHT_D	8.5909	2.2532	.7351	.5488	.7070

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Reliability Coefficients   3 items

Alpha = .8266   Standardized item alpha = .8263

Factor Analysis Question 17

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.181	32.529	32.529	6.181	32.529	32.529
2	3.334	17.546	50.075	3.334	17.546	50.075
3	2.122	11.167	61.242	2.122	11.167	61.242
4	1.689	8.888	70.130	1.689	8.888	70.130
5	1.524	8.022	78.152	1.524	8.022	78.152
6	1.176	6.189	84.341	1.176	6.189	84.341
7	.895	4.710	89.052			
8	.824	4.339	93.390			
9	.478	2.515	95.905			
10	.363	1.908	97.814			
11	.251	1.321	99.135			
12	.116	.610	99.745			
13	4.852E-02	.255	100.000			
14	1.137E-15	5.982E-15	100.000			
15	3.053E-16	1.607E-15	100.000			
16	1.923E-17	1.012E-16	100.000			
17	-9.52E-17	-5.012E-16	100.000			
18	-2.52E-16	-1.325E-15	100.000			
19	-4.49E-16	-2.365E-15	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix

	Component					
	1	2	3	4	5	6
SEVTN_A	.785					
SEVTN_B	.845					
SEVTN_C	.635		.510			
SEVTN_D	.625					
SEVTN_E		.846				
SEVTN_F		.614		-.513		
SEVTN_G	.686	.514				
SEVTN_H	.546		-.592			
SEVTN_I	.735					
SEVTN_J	-.633					
SEVTN_K					.692	
SEVTN_L			.624			
SEVTN_M	.795					
SEVTN_N		.583	-.514			
SEVTN_O						
SEVTN_P		.825				
SEVTN_Q				-.652		
SEVTN_R	.815					
SEVTN_S	.547					

Extraction Method: Principal Component Analysis.

a. 6 components extracted.

Reliability

*** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	SEVTN_A	4.1364	.8335	22.0
2.	SEVTN_B	3.5909	1.1816	22.0
3.	SEVTN_I	4.5000	.8591	22.0
4.	SEVTN_M	3.6818	1.1705	22.0
5.	SEVTN_R	4.3182	.8387	22.0

Covariance Matrix

	SEVTN_A	SEVTN_B	SEVTN_I	SEVTN_M	SEVTN_R
SEVTN_A	.6948				
SEVTN_B	.5346	1.3961			
SEVTN_I	.3571	.6905	.7381		
SEVTN_M	.6645	.9589	.6905	1.3701	
SEVTN_R	.2879	.6602	.5000	.6299	.7035

Correlation Matrix

	SEVTN_A	SEVTN_B	SEVTN_I	SEVTN_M	SEVTN_R
SEVTN_A	1.0000				
SEVTN_B	.5428	1.0000			
SEVTN_I	.4987	.6802	1.0000		
SEVTN_M	.6811	.6933	.6866	1.0000	
SEVTN_R	.4118	.6662	.6939	.6416	1.0000

N of Cases = 22.0

Statistics for	Mean	Variance	Std Dev	N of Variables
Scale	20.2273	16.8506	4.1050	5

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
SEVTN_A	16.0909	12.4675	.6266	.4809	.8833
SEVTN_B	16.6364	9.7662	.7702	.6012	.8546
SEVTN_I	15.7273	11.6364	.7637	.6086	.8562
SEVTN_M	16.5455	9.5931	.8120	.6782	.8424
SEVTN_R	15.9091	11.9913	.7154	.5738	.8664

Reliability Coefficients 5 items

Alpha = .8863 Standardized item alpha = .8906

Reliability

** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	SEVTN_E	4.1429	.7270	21.0
2.	SEVTN_P	4.3333	.8563	21.0

Covariance Matrix

	SEVTN_E	SEVTN_P
SEVTN_E	.5286	
SEVTN_P	.3500	.7333

Correlation Matrix

	SEVTN_E	SEVTN_P
SEVTN_E	1.0000	
SEVTN_P	.5622	1.0000

N of Cases = 21.0

Statistics for	Mean	Variance	Std Dev	N of Variables
Scale	8.4762	1.9619	1.4007	2

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
SEVTN_E	4.3333	.7333	.5622	.3160	.
SEVTN_P	4.1429	.5286	.5622	.3160	.

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Reliability Coefficients   2 items

Alpha = .7136   Standardized item alpha = .7197

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	PROBDEF1[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: THREE

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.356[a]	.127	.111	.6038

a. Predictors: (Constant), PROBDEF1

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.016	1	3.016	8.272	.006[a]
	Residual	20.781	57	.365		
	Total	23.797	58			

a. Predictors: (Constant), PROBDEF1

b. Dependent Variable: THREE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.173	.176		12.314	.000
	PROBDEF1	.202	.070	.356	2.876	.006

a. Dependent Variable: THREE

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	BARRIER1[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: THREE

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.247[a]	.061	.043	.4693

a. Predictors: (Constant), BARRIER1

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.761	1	.761	3.456	.069[a]
	Residual	11.675	53	.220		
	Total	12.436	54			

a. Predictors: (Constant), BARRIER1

b. Dependent Variable: THREE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.398	.197		12.165	.000
	BARRIER1	.144	.078	.247	1.859	.069

a. Dependent Variable: THREE

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	APPLY4[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: EIGHT

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.124[a]	.015	-.034	2.0187

a. Predictors: (Constant), APPLY4

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.271	1	1.271	.312	.583[a]
	Residual	81.501	20	4.075		
	Total	82.773	21			

a. Predictors: (Constant), APPLY4

b. Dependent Variable: EIGHT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.102	2.579		1.590	.127
	APPLY4	-.342	.612	-.124	-.559	.583

a. Dependent Variable: EIGHT

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	APPLY5[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: EIGHT

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.186[a]	.035	-.016	2.0282

a. Predictors: (Constant), APPLY5

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.797	1	2.797	.680	.420[a]
	Residual	78.155	19	4.113		
	Total	80.952	20			

a. Predictors: (Constant), APPLY5

b. Dependent Variable: EIGHT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.689	2.780		.248	.807
	APPLY5	.534	.648	.186	.825	.420

a. Dependent Variable: EIGHT

Regression

ANOVA

PROBDEF1

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.468	2	4.234	3.635	.033
Within Groups	65.219	56	1.165		
Total	73.686	58			

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.259	1	1.259	.309	.585[a]
	Residual	81.514	20	4.076		
	Total	82.773	21			

a. Predictors: (Constant), APPLY3

b. Dependent Variable: EIGHT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.989	2.392		1.668	.111
	APPLY3	-.322	.579	-.123	-.556	.585

a. Dependent Variable: EIGHT

Oneway

Descriptives

PROBDEF1

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
1.00	27	2.2500	1.0447	.2010	1.8367	2.6633	.00	3.75
2.00	7	3.2143	.8219	.3107	2.4541	3.9745	2.00	4.00
3.00	25	1.9700	1.1689	.2338	1.4875	2.4525	.00	3.75
Total	59	2.2458	1.1271	.1467	1.9520	2.5395	.00	4.00

Oneway

Descriptives

BARRIER1

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
1.00	27	2.6508	.9150	.1761	2.2888	3.0128	.57	4.14
2.00	7	2.2245	.8242	.3115	1.4622	2.9867	1.29	3.57
3.00	21	2.1565	.6176	.1348	1.8753	2.4376	1.14	3.43
Total	55	2.4078	.8236	.1111	2.1851	2.6304	.57	4.14

ANOVA

BARRIER1

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.156	2	1.578	2.451	.096
Within Groups	33.473	52	.644		
Total	36.629	54			

Oneway

Descriptives

SEARCH3

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1.00	10	3.9000	.9661	.3055	3.2089	4.5911	2.00	5.00
2.00	3	3.6667	1.2583	.7265	.5409	6.7925	2.50	5.00
3.00	10	4.1000	1.0220	.3232	3.3689	4.8311	1.50	5.00
Total	23	3.9565	.9876	.2059	3.5295	4.3836	1.50	5.00

ANOVA

SEARCH3

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.490	2	.245	.234	.794
Within Groups	20.967	20	1.048		
Total	21.457	22			

Oneway

Descriptives

SEARCH2

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1.00	10	3.1500	1.4916	.4717	2.0829	4.2171	.50	5.00
2.00	3	4.3333	.2887	.1667	3.6162	5.0504	4.00	4.50
3.00	10	2.1500	1.2704	.4017	1.2412	3.0588	.00	4.00
Total	23	2.8696	1.4633	.3051	2.2368	3.5024	.00	5.00

ANOVA

SEARCH2

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	12.392	2	6.196	3.569	.047
Within Groups	34.717	20	1.736		
Total	47.109	22			

Oneway

Descriptives

ADAPT1

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
1.00	5	3.9200	.6261	.2800	3.1426	4.6974	3.00	4.60
2.00	2	4.3000	.4243	.3000	.4881	8.1119	4.00	4.60
3.00	6	3.3333	1.3779	.5625	1.8873	4.7794	1.00	4.60
Total	13	3.7077	1.0412	.2888	3.0785	4.3369	1.00	4.60

ANOVA

ADAPT1

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.768	2	.884	.786	.482
Within Groups	11.241	10	1.124		
Total	13.009	12			

Oneway

Descriptives

LEARN1

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
1.00	10	4.1333	.8195	.2592	3.5471	4.7196	2.67	5.00
2.00	3	4.6667	.5774	.3333	3.2324	6.1009	4.00	5.00
3.00	9	4.3333	.7265	.2422	3.7749	4.8918	2.67	5.00
Total	22	4.2879	.7439	.1586	3.9581	4.6177	2.67	5.00

ANOVA

LEARN1

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.688	2	.344	.598	.560
Within Groups	10.933	19	.575		
Total	11.621	21			

Oneway

ANOVA

APPLY4

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.983	2	.491	.944	.407
Within Groups	9.892	19	.521		
Total	10.875	21			

Oneway

ANOVA

APPLY5

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.699	2	.350	.691	.514
Within Groups	9.110	18	.506		
Total	9.810	20			

Descriptives

APPLY5

					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
1.00	10	4.0500	.6852	.2167	3.5599	4.5401	3.00	5.00
2.00	3	4.3333	.7638	.4410	2.4360	6.2306	3.50	5.00
3.00	8	4.4375	.7289	.2577	3.8282	5.0468	3.00	5.00
Total	21	4.2381	.7003	.1528	3.9193	4.5569	3.00	5.00

Appendix F

Eucha & Spavinaw Lakes Participant Survey

Strategic Policy Innovation Project

Eucha & Spavinaw Lakes Participant Survey

Prepared By

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Name ____
(Please Print)

The questions below deal with the problem of protecting water quality in the Lake Eucha/Spavinaw watershed. This issue is an emerging case of significant environmental policy change and innovation faced by the City of Tulsa. Ths survey is designed to elicit your views on aspects of policy innovation and learning in the Lake Eucha/Spavinaw case. For the purposes of this survey, a policy innovation is defined as "**a program or practice which is new to the implementing institution, and which is evidenced by a change in standard operating practices**".

1. When you became aware that you had a problem which required a response, what information did you utilize to specify the exact nature of the problem, and how important was each type?

Please circle a number indicating the relative importance of the following, using the scale shown at the right.	Very Important 1	2	Somewhat Important 3	4	Not Important 5	Did not Access 6
a. Obtained information from academic journals	1	2	3	4	5	6
b. Obtained information from magazine articles	1	2	3	4	5	6
c. Obtained information from newspaper articles	1	2	3	4	5	6
d. Obtained information from books	1	2	3	4	5	6
e. Had discussions with experts	1	2	3	4	5	6
f. Attended specialized workshops	1	2	3	4	5	6
g. Obtained information from government agencies other than my own (if applicable).	1	2	3	4	5	6
h. Obtained information from within my own government agency (if applicable).	1	2	3	4	5	6
i. Internet Research	1	2	3	4	5	6

2. How quickly did you become familiar with the problem (please check one)?

- ☐ One-two months
- ☐ Two-six months
- ☐ Six months to a year
- ☐ More than a year
- ☐ Still learning

3. Once the nature of the problem was determined, how would you characterize the ease with which an approach toward an initial solution was found and adopted?

- ☐ Easily found and adopted
- ☐ Easily found, had difficulties adopting
- ☐ Difficult to find, had to design new solutions

4. Of the following possible reasons for difficulties encountered while adopting the chosen approach, please circle a number indicating their relative importance, using the scale shown at right.

	Very Important		Somewhat Important		Not Important	Did not Access
	1	2	3	4	5	6
a. Inadequate scientific/technical information	1	2	3	4	5	6
b. Unavailable scientific/technical information	1	2	3	4	5	6
c. Lack of understanding of scientific/technical information	1	2	3	4	5	6
d. Lack of timely scientific/technical information	1	2	3	4	5	6
e. Too costly	1	2	3	4	5	6
f. Funding mechanism unavailable	1	2	3	4	5	6
g. Solution required "thinking outside the box"	1	2	3	4	5	6
h. City of Tulsa bureaucratic structure unable to accommodate solution	1	2	3	4	5	6
i. Not acceptable to politicians	1	2	3	4	5	6
j. Not acceptable to public	1	2	3	4	5	6
k. Risk of failure	1	2	3	4	5	6
l. Lack of regulatory flexibility	1	2	3	4	5	6
m. Not enough time to adequately analyze scientific/technical information	1	2	3	4	5	6
n. Encountered difficulties interacting with other agencies/levels of government	1	2	3	4	5	6
o. Lack of organizational diversity	1	2	3	4	5	6
p. Solution sought too quickly	1	2	3	4	5	6
q. Solution sought too slowly	1	2	3	4	5	6
r. Lack of media support	1	2	3	4	5	6
s. Lack of recognition	1	2	3	4	5	6
t. Fear of not being re-elected	1	2	3	4	5	6

5. Using the scale presented below, what is the relative importance of the following sources of information in the search for new solutions.

	Very Important		Somewhat Important		Not Important	Did not Access
	1	2	3	4	5	6
a. Academic papers	1	2	3	4	5	6
b. Personal interviews with academics	1	2	3	4	5	6
c. Personal interviews with agency personnel	1	2	3	4	5	6
d. Federal government sources	1	2	3	4	5	6
e. State government sources	1	2	3	4	5	6
f. Personal experience and opinions	1	2	3	4	5	6
g. Expert opinions/guidance	1	2	3	4	5	6
h. Private contract service	1	2	3	4	5	6
i. Independent field reports	1	2	3	4	5	6
j. Identified similar problem and solution elsewhere	1	2	3	4	5	6
k. Internet resources	1	2	3	4	5	6

6. For approaches which were "borrowed" from another location with a similar problem, please rank the relative importance of the following in adaptation of the approach to the problem. (Use the scale presented below. If no approaches were borrowed, please go to question #7)

	Very Important		Somewhat Important		Not Important	Did not Access
a. No adaptation occurred, approach was adopted as it was found (Go to question #7)	1	2	3	4	5	6
b. Academic papers	1	2	3	4	5	6
c. Personal interviews with academics	1	2	3	4	5	6
d. Personal interviews with agency personnel	1	2	3	4	5	6
e. Federal government sources	1	2	3	4	5	6
f. State government sources	1	2	3	4	5	6
g. Personal experience and opinions	1	2	3	4	5	6
h. Expert opinions/guidance	1	2	3	4	5	6
i. Private contract service	1	2	3	4	5	6
j. Independent field reports	1	2	3	4	5	6
k. Public supportiveness	1	2	3	4	5	6

7. In your experience with policy innovation, how important do you find the following factors to be? Please rate using the scale below.

	Very Important 1	2	Somewhat Important 3	4	Not Important 5	Did not Access 6
a. Cooperation between many agencies and/or levels of government	1	2	3	4	5	6
b. Volunteers	1	2	3	4	5	6
c. User fees and market-like approaches	1	2	3	4	5	6
d. Flow of information and individuals across organizational boundaries	1	2	3	4	5	6
e. Flow of information and individuals across bureaucratic and political boundaries	1	2	3	4	5	6
f. Planning and analysis as key aspects	1	2	3	4	5	6
g. Public support	1	2	3	4	5	6

8. Which of the following factors have you adopted based on your previous experiences, and how important are each? Please use the scale below.

	Very Important		Somewhat Important		Not Important	Did not Access
	1	2	3	4	5	6
a. Information analysis	1	2	3	4	5	6
b. Information access	1	2	3	4	5	6
c. Information flow	1	2	3	4	5	6
d. Information use	1	2	3	4	5	6
e. Flexible organizational structure	1	2	3	4	5	6
f. Holistic programs	1	2	3	4	5	6
g. Networking	1	2	3	4	5	6
h. Ad-hoc task forces	1	2	3	4	5	6
i. Leadership	1	2	3	4	5	6
9. How important, in your experience, do you think public support is in the ultimate success of policy? (Please circle the correct number using the scale above)	1	2	3	4	5	6

10. If you feel public support is important, please indicate, using the scale below, the importance of each of the following factors in motivating public support.

a. Political coalitions	1	2	3	4	5	6
b. Voluntary associations	1	2	3	4	5	6
c. Public awareness/education	1	2	3	4	5	6
d. Political demands on decision makers	1	2	3	4	5	6
11. How important, in your opinion, is private sector participation in the ultimate success of policy?	1	2	3	4	5	6

12. If you feel private sector participation is important, please indicate the importance of each of the following activities using the scale below.

Very Important		Somewhat Important		Not Important	Did not Access
1	2	3	4	5	6

a. Providing publicity	1	2	3	4	5	6
b. Providing resources	1	2	3	4	5	6
c. Providing program piloting/demonstrations	1	2	3	4	5	6

13. How important in determining the course of policy outcomes are the courts? (Please use the scale above)	1	2	3	4	5	6

14. If you feel the courts are important, please rank the importance of the following activities, using the scale above.

a. Clarification of ambiguous statutes	1	2	3	4	5	6
b. Deriving legitimacy for new ideas	1	2	3	4	5	6

15. How important in motivating policy innovation are the City Council or regional governments?	1	2	3	4	5	6

16. If you feel the government is important in motivating policy innovation, please rank the importance of the following activities, using the scale above.

a. Development of study committees	1	2	3	4	5	6
b. Proclamations/statutes/ordinances	1	2	3	4	5	6
c. Public hearings	1	2	3	4	5	6

17. What techniques/approaches did you learn from past involvement with policy-making that you are using now when confronted with environmental policy questions? (Please check all that apply and indicate their relative importance, using the scale at right)

	Very Important 1	2	Somewhat Important 3	4	Not Important 5	Did not Access 6
☐ Organizational flexibility	1	2	3	4	5	6
☐ Development of task forces	1	2	3	4	5	6
☐ Scanning to determine how other municipalities have dealt with similar issues	1	2	3	4	5	6
☐ Recruitment of technical expertise	1	2	3	4	5	6
☐ Accessing external information	1	2	3	4	5	6
☐ Discussions with experts	1	2	3	4	5	6
☐ Attending workshops/conferences	1	2	3	4	5	6
☐ Unique funding mechanisms	1	2	3	4	5	6
☐ Public participation/support	1	2	3	4	5	6
☐ Don't fear failure	1	2	3	4	5	6
☐ Intergovernmental interactions	1	2	3	4	5	6
☐ Use of volunteers	1	2	3	4	5	6
☐ Single individuals serving in multiple roles	1	2	3	4	5	6
☐ Planning and analysis	1	2	3	4	5	6
☐ Systems thinking	1	2	3	4	5	6
☐ Networking	1	2	3	4	5	6
☐ Community involvement	1	2	3	4	5	6
☐ Crisis motivates change	1	2	3	4	5	6
☐ Other (please specify)________________	1	2	3	4	5	6

____

____

The remainder of this survey asks questions about your professional background. You are under no obligation to complete this portion of the survey if you do not wish to.

18. Please describe your current job function. ________________________________

____

19. Please mark the box which most closely describes your professional training/background.

- ☐ Scientist
- ☐ Public Manager
- ☐ Public Official
- ☐ Lawyer
- ☐ Private Manager
- ☐ Other (Please describe) ________________________________

20. Please indicate the approximate number of years experience you have.

- ☐ 1-3 years
- ☐ 4-6 years
- ☐ 7-10 years
- ☐ 10-15 years
- ☐ 15-20 years
- ☐ Greater than 20 years

Appendix G

SPSS Results for Lake Eucha Survey

Factor Analysis Question 1

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.077	45.301	45.301	4.077	45.301	45.301
2	1.912	21.244	66.545	1.912	21.244	66.545
3	1.047	11.636	78.180	1.047	11.636	78.180
4	.748	8.312	86.493			
5	.457	5.081	91.573			
6	.393	4.365	95.938			
7	.173	1.923	97.861			
8	.128	1.424	99.285			
9	6.437E-02	.715	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix

	Component		
	1	2	3
ONE_A	.867		
ONE_B	.773		
ONE_C		-.875	
ONE_D	.734		
ONE_E	.676		-.605
ONDE_F	.683		
ONE_G	.720		
ONE_H		.768	
ONE_I	.753		

Extraction Method: Principal Component An

a. 3 components extracted.

Reliability

*** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S - S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	ONE_A	2.9444	1.7978	18.0
2.	ONE_B	2.1111	1.5297	18.0
3.	ONE_D	2.7778	1.8005	18.0
4.	ONDE_F	3.4444	1.7896	18.0
5.	ONE_G	4.1111	1.2314	18.0
6.	ONE_I	2.2778	1.6017	18.0

Covariance Matrix

	ONE_A	ONE_B	ONE_D	ONDE_F	ONE_G	ONE_I
ONE_A	3.2320					
ONE_B	2.1242	2.3399				
ONE_D	2.1634	1.5556	3.2418			
ONDE_F	1.7908	1.3007	1.4575	3.2026		
ONE_G	1.1830	.6340	.9673	.8301	1.5163	
ONE_I	1.6046	1.8497	1.4771	.9869	1.0850	2.5654

Correlation Matrix

	ONE_A	ONE_B	ONE_D	ONDE_F	ONE_G	ONE_I
ONE_A	1.0000					
ONE_B	.7724	1.0000				
ONE_D	.6684	.5648	1.0000			
ONDE_F	.5566	.4751	.4523	1.0000		
ONE_G	.5344	.3366	.4363	.3767	1.0000	
ONE_I	.5572	.7550	.5122	.3443	.5501	1.0000

R E L I A B I L I T Y   A N A L Y S I S - S C A L E   (A L P H A)

N of Cases = 18.0

Statistics for	Mean	Variance	Std Dev	N of Variables
Scale	17.6667	58.1176	7.6235	6

Item-total Statistics

Item Deleted	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
ONE_A	14.7222	37.1536	.8091	.7689	.8171
ONE_B	15.5556	40.8497	.7635	.8145	.8290
ONE_D	14.8889	39.6340	.6723	.4846	.8445
ONDE_F	14.2222	42.1830	.5477	.3420	.8679
ONE_G	13.5556	47.2026	.5555	.5413	.8639
ONE_I	15.3889	41.5458	.6784	.7227	.8428

Reliability Coefficients 6 items

Alpha = .8676 Standardized item alpha = .8695

Factor Analysis Question 4

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.246	31.232	31.232	6.246	31.232	31.232
2	3.180	15.899	47.131	3.180	15.899	47.131
3	2.163	10.817	57.948	2.163	10.817	57.948
4	1.929	9.645	67.594	1.929	9.645	67.594
5	1.554	7.770	75.363	1.554	7.770	75.363
6	1.236	6.180	81.543	1.236	6.180	81.543
7	1.073	5.367	86.910	1.073	5.367	86.910
8	.873	4.367	91.277			
9	.477	2.384	93.660			
10	.389	1.946	95.606			
11	.318	1.591	97.197			
12	.222	1.108	98.305			
13	.189	.946	99.251			
14	6.708E-02	.335	99.586			
15	4.915E-02	.246	99.832			
16	3.364E-02	.168	100.000			
17	3.691E-16	1.846E-15	100.000			
18	1.327E-16	6.637E-16	100.000			
19	-1.48E-16	-7.385E-16	100.000			
20	-2.94E-16	-1.472E-15	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix

	Component						
	1	2	3	4	5	6	7
FOUR_A	.801						
FOUR_B	.766						
FOUR_C	.716						
FOUR_D	.729						
FOUR_E					-.521		
FOUR_F	.507	.670					
FOUR_G		.689					
FOUR_H			.601				
FOUR_I		.844					
FOUR_J	.647		.534				
FOUR_K			.599			.518	
FOUR_L	.645						
FOUR_M	.699			-.513			
FOUR_N		.778					
FOUR_O					.612		
FOUR_P	.691						
FOUR_Q							
FOUR_R	.569			.543			
FOUR_S	.618			.611			
FOUR_T	.619						

Extraction Method: Principal Component Analysis.

a. 7 components extracted.

Reliability

**** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	FOUR_A	3.4737	1.2635	19.0
2.	FOUR_B	3.1053	1.7287	19.0
3.	FOUR_C	2.5789	1.5390	19.0
4.	FOUR_D	2.6316	1.5352	19.0
5.	FOUR_L	2.2105	1.5121	19.0
6.	FOUR_P	2.6842	1.4163	19.0
7.	FOUR_T	1.6316	1.5709	19.0

Covariance Matrix

	FOUR_A	FOUR_B	FOUR_C	FOUR_D	FOUR_L
FOUR_A	1.5965				
FOUR_B	1.9474	2.9883			
FOUR_C	1.0994	1.0468	2.3684		
FOUR_D	1.3509	1.8187	1.5585	2.3567	
FOUR_L	1.0614	1.4766	.9269	.6930	2.2865
FOUR_P	.9912	1.3684	.9152	1.0994	.8480
FOUR_T	.7953	1.0409	1.1696	1.1345	1.3041

	FOUR_P	FOUR_T
FOUR_P	2.0058	
FOUR_T	.7105	2.4678

Correlation Matrix

	FOUR_A	FOUR_B	FOUR_C	FOUR_D	FOUR_L
FOUR_A	1.0000				
FOUR_B	.8916	1.0000			
FOUR_C	.5654	.3935	1.0000		
FOUR_D	.6964	.6853	.6597	1.0000	
FOUR_L	.5555	.5649	.3983	.2985	1.0000
FOUR_P	.5539	.5589	.4199	.5057	.3959
FOUR_T	.4007	.3833	.4838	.4704	.5490

	FOUR_P	FOUR_T
FOUR_P	1.0000	
FOUR_T	.3194	1.0000

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

N of Cases = 19.0

Statistics for	Mean	Variance	Std Dev	N of Variables
Scale	18.3158	64.7836	8.0488	7

Item-total Statistics

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
FOUR_A	14.8421	48.6959	.8218	.8510	.8433
FOUR_B	15.2105	44.3977	.7552	.8649	.8464
FOUR_C	15.7368	48.9825	.6236	.6274	.8643
FOUR_D	15.6842	47.1170	.7264	.7218	.8507
FOUR_L	16.1053	49.8772	.5909	.5591	.8684
FOUR_P	15.6316	50.9123	.5871	.3677	.8685
FOUR_T	16.6842	50.0058	.5541	.4392	.8736

Reliability Coefficients 7 items

Alpha = .8773 Standardized item alpha = .8801

Reliability

**** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y A N A L Y S I S - S C A L E (A L P H A)

		Mean	Std Dev	Cases
1.	FOUR_N	3.1429	1.6518	21.0
2.	FOUR_G	3.0476	1.9099	21.0

Covariance Matrix

	FOUR_N	FOUR_G
FOUR_N	2.7286	
FOUR_G	1.8929	3.6476

Correlation Matrix

	FOUR_N	FOUR_G
FOUR_N	1.0000	
FOUR_G	.6000	1.0000

N of Cases = 21.0

Statistics for	Mean	Variance	Std Dev	N of Variables
Scale	6.1905	10.1619	3.1878	2

Item-total Statistics

Item Deleted	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if
FOUR_N	3.0476	3.6476	.6000	.3600	.
FOUR_G	3.1429	2.7286	.6000	.3600	.

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Reliability Coefficients   2 items

Alpha =   .7451   Standardized item alpha =   .7500

Factor Analysis Question 5

Total Variance Explained

Component	Initial Eigenvalues Total	Initial Eigenvalues % of Variance	Initial Eigenvalues Cumulative %	Extraction Sums of Squared Loadings Total	Extraction Sums of Squared Loadings % of Variance	Extraction Sums of Squared Loadings Cumulative %
1	4.550	41.365	41.365	4.550	41.365	41.365
2	1.882	17.110	58.475	1.882	17.110	58.475
3	1.249	11.357	69.831	1.249	11.357	69.831
4	1.074	9.759	79.590	1.074	9.759	79.590
5	.881	8.010	87.600			
6	.570	5.179	92.779			
7	.362	3.288	96.067			
8	.210	1.910	97.977			
9	.154	1.401	99.377			
10	5.982E-02	.544	99.921			
11	8.678E-03	7.889E-02	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix

	Component 1	2	3	4
FIVE_A		.551	-.584	
FIVE_B	.842			
FIVE_C	.828			
FIVE_D	.791			
FIVE_E	.876			
FIVE_F	.699			
FIVE_G	.817			
FIVE_H	.507			.744
FIVE_I		.889		
FIVE_J		.671	.578	
FIVE_K				

Extraction Method: Principal Component Analysis.

a. 4 components extracted.

Reliability

**** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	FIVE_C	3.6364	1.0931	22.0
2.	FIVE_D	3.7273	.9351	22.0

Covariance Matrix

	FIVE_C	FIVE_D
FIVE_C	1.1948	
FIVE_D	.9437	.8745

Correlation Matrix

	FIVE_C	FIVE_D
FIVE_C	1.0000	
FIVE_D	.9233	1.0000

N of Cases = 22.0

Statistics for	Mean	Variance	Std Dev	N of Variables
Scale	7.3636	3.9567	1.9891	2

Item-total Statistics

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
FIVE_C	3.7273	.8745	.9233	.8524	.
FIVE_D	3.6364	1.1948	.9233	.8524	.

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Reliability Coefficients 2 items

Alpha = .9540 Standardized item alpha = .9601

Factor Analysis Question 6

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.289	32.893	32.893	3.289	32.893	32.893
2	2.536	25.358	58.251	2.536	25.358	58.251
3	1.326	13.263	71.514	1.326	13.263	71.514
4	1.283	12.834	84.348	1.283	12.834	84.348
5	.848	8.481	92.829			
6	.447	4.470	97.298			
7	.190	1.902	99.201			
8	6.552E-02	.655	99.856			
9	1.441E-02	.144	100.000			
10	-3.37E-16	-3.367E-15	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix

	Component			
	1	2	3	4
SIX_B	.870			
SIX_C			.527	
SIX_D		.581		-.503
SIX_E		.842		
SIX_F	-.506	.801		
SIX_G	-.621			.622
SIX_H	-.625			
SIX_I	.594		.703	
SIX_J		.652		.554
SIX_K	.737			

Extraction Method: Principal Component Analysis.
a. 4 components extracted.

Reliability

**** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	SIX_B	3.4545	1.5076	11.0
2.	SIX_K	3.5455	1.7529	11.0

Covariance Matrix

	SIX_B	SIX_K
SIX_B	2.2727	
SIX_K	.8273	3.0727

Correlation Matrix

	SIX_B	SIX_K
SIX_B	1.0000	
SIX_K	.3130	1.0000

N of Cases = 11.0

Statistics for	Mean	Variance	Std Dev	N of Variables
Scale	7.0000	7.0000	2.6458	2

Item-total Statistics

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
SIX_B	3.5455	3.0727	.3130	.0980	.
SIX_K	3.4545	2.2727	.3130	.0980	.

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Reliability Coefficients   2 items

Alpha = .4727   Standardized item alpha = .4768

Factor Analysis Question 8

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.978	33.089	33.089	2.978	33.089	33.089
2	1.920	21.329	54.418	1.920	21.329	54.418
3	1.373	15.259	69.677	1.373	15.259	69.677
4	1.024	11.376	81.053	1.024	11.376	81.053
5	.702	7.804	88.857			
6	.464	5.160	94.017			
7	.317	3.517	97.534			
8	.188	2.088	99.622			
9	3.403E-02	.378	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix

	Component			
	1	2	3	4
EIGHT_A	.593	-.618		
EIGHT_B	.614			-.534
EIGHT_C	.879			
EIGHT_D	.802			
EIGHT_E		.522	.643	
EIGHT_F				.739
EIGHT_G	.513			
EIGHT_H	.670		-.583	
EIGHT_I		.851		

Extraction Method: Principal Component Analysis.
a. 4 components extracted.

Reliability

**** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	EIGHT_C	4.3158	.9459	19.0
2.	EIGHT_D	4.3684	.7609	19.0

Covariance Matrix

	EIGHT_C	EIGHT_D
EIGHT_C	.8947	
EIGHT_D	.5994	.5789

Correlation Matrix

	EIGHT_C	EIGHT_D
EIGHT_C	1.0000	
EIGHT_D	.8328	1.0000

N of Cases = 19.0

Statistics for	Mean	Variance	Std Dev	N of Variables
Scale	8.6842	2.6725	1.6348	2

Item-total Statistics

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
EIGHT_C	4.3684	.5789	.8328	.6936	.
EIGHT_D	4.3158	.8947	.8328	.6936	.

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Reliability Coefficients   2 items

Alpha = .8972   Standardized item alpha = .9088

Factor Analysis Question 17

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.933	21.849	21.849	3.933	21.849	21.849
2	3.374	18.746	40.595	3.374	18.746	40.595
3	3.051	16.950	57.545	3.051	16.950	57.545
4	2.349	13.052	70.598	2.349	13.052	70.598
5	1.708	9.492	80.089	1.708	9.492	80.089
6	1.313	7.297	87.386	1.313	7.297	87.386
7	.970	5.390	92.776			
8	.573	3.181	95.957			
9	.317	1.761	97.718			
10	.241	1.339	99.056			
11	.170	.944	100.000			
12	6.549E-16	3.638E-15	100.000			
13	3.826E-16	2.125E-15	100.000			
14	2.410E-16	1.339E-15	100.000			
15	1.874E-16	1.041E-15	100.000			
16	1.495E-17	8.307E-17	100.000			
17	-1.42E-16	-7.886E-16	100.000			
18	-2.90E-16	-1.609E-15	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix

	Component					
	1	2	3	4	5	6
SEVTN_A		-.788				
SEVTN_B			.640			
SEVTN_C	.508	.604				
SEVTN_D	.538		.528			
SEVTN_E	.863					
SEVTN_F		.753				
SEVTN_G		.563				
SEVTN_H						.683
SEVTN_I	.867					
SEVTN_J			-.557	.578		
SEVTN_K				.802		
SEVTN_L					-.627	
SEVTN_M			.815			
SEVTN_N					.824	
SEVTN_O	-.680					
SEVTN_P		.747				
SEVTN_Q	.747					
SEVTN_R			.577			

Extraction Method: Principal Component Analysis.

a. 6 components extracted.

Reliability

*****Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	SEVTN_E	4.0714	.8287	14.0
2.	SEVTN_I	3.7857	.8018	14.0

Covariance Matrix

	SEVTN_E	SEVTN_I
SEVTN_E	.6868	
SEVTN_I	.4011	.6429

Correlation Matrix

	SEVTN_E	SEVTN_I
SEVTN_E	1.0000	
SEVTN_I	.6036	1.0000

N of Cases = 14.0

Statistics for	Mean	Variance	Std Dev	N of Variables
Scale	7.8571	2.1319	1.4601	2

Item-total Statistics

Item Deleted	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if
SEVTN_E	3.7857	.6429	.6036	.3644	.
SEVTN_I	4.0714	.6868	.6036	.3644	.

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Reliability Coefficients   2 items

Alpha =   .7526   Standardized item alpha =   .7528

Reliability

***** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Mean   Std Dev   Cases

1.	SEVTN_B	3.3846	1.1209	13.0
2.	SEVTN_M	3.3077	1.4367	13.0
3.	SEVTN_R	4.1538	.8987	13.0

Covariance Matrix

	SEVTN_B	SEVTN_M	SEVTN_R
SEVTN_B	1.2564		
SEVTN_M	.7885	2.0641	
SEVTN_R	.6026	.6154	.8077

Correlation Matrix

	SEVTN_B	SEVTN_M	SEVTN_R
SEVTN_B	1.0000		
SEVTN_M	.4896	1.0000	
SEVTN_R	.5982	.4766	1.0000

N of Cases = 13.0

Statistics for	Mean	Variance	Std Dev	N of Variables
Scale	10.8462	8.1410	2.8532	3

Item-total Statistics

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
SEVTN_B	7.4615	4.1026	.6127	.4119	.6000
SEVTN_M	7.5385	3.2692	.5404	.2923	.7373
SEVTN_R	6.6923	4.8974	.6124	.4022	.6440

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Reliability Coefficients   3 items

Alpha = .7394   Standardized item alpha = .7658

Reliability

**** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	SEVTN_F	4.3333	.9759	15.0
2.	SEVTN_G	2.9333	.8837	15.0

Covariance Matrix

	SEVTN_F	SEVTN_G
SEVTN_F	.9524	
SEVTN_G	.5952	.7810

Correlation Matrix

	SEVTN_F	SEVTN_G
SEVTN_F	1.0000	
SEVTN_G	.6902	1.0000

N of Cases = 15.0

Statistics for	Mean	Variance	Std Dev	N of Variables
Scale	7.2667	2.9238	1.7099	2

Item-total Statistics

Item Deleted	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
SEVTN_F	2.9333	.7810	.6902	.4764	.
SEVTN_G	4.3333	.9524	.6902	.4764	.

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Reliability Coefficients   2 items

Alpha =   .8143   Standardized item alpha =   .8167

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	PROBDEF1[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: THREE

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.765[a]	.585	.559	.4555

a. Predictors: (Constant), PROBDEF1

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.680	1	4.680	22.556	.000[a]
	Residual	3.320	16	.207		
	Total	8.000	17			

a. Predictors: (Constant), PROBDEF1

b. Dependent Variable: THREE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.549	.278		16.387	.000
	PROBDEF1	-.413	.087	-.765	-4.749	.000

a. Dependent Variable: THREE

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	BARRIER1[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: THREE

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.642[a]	.412	.378	.6093

a. Predictors: (Constant), BARRIER1

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.426	1	4.426	11.923	.003[a]
	Residual	6.311	17	.371		
	Total	10.737	18			

a. Predictors: (Constant), BARRIER1

b. Dependent Variable: THREE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.602	.355		12.948	.000
	BARRIER1	-.431	.125	-.642	-3.453	.003

a. Dependent Variable: THREE

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	BARRIER2[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: THREE

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.382[a]	.146	.101	.7079

a. Predictors: (Constant), BARRIER2

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.623	1	1.623	3.239	.088[a]
	Residual	9.520	19	.501		
	Total	11.143	20			

a. Predictors: (Constant), BARRIER2

b. Dependent Variable: THREE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.064	.385		10.550	.000
	BARRIER2	-.212	.118	-.382	-1.800	.088

a. Dependent Variable: THREE

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	PROBDEF1[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: TWO

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.080[a]	.006	-.056	1.5859

a. Predictors: (Constant), PROBDEF1

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.259	1	.259	.103	.752[a]
	Residual	40.241	16	2.515		
	Total	40.500	17			

a. Predictors: (Constant), PROBDEF1

b. Dependent Variable: TWO

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.453	.967		4.607	.000
	PROBDEF1	-9.72E-02	.303	-.080	-.321	.752

a. Dependent Variable: TWO

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	BARRIER1[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: TWO

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.265[a]	.070	.016	1.6536

a. Predictors: (Constant), BARRIER1

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.513	1	3.513	1.285	.273[a]
	Residual	46.487	17	2.735		
	Total	50.000	18			

a. Predictors: (Constant), BARRIER1

b. Dependent Variable: TWO

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.995	.965		3.104	.006
	BARRIER1	.384	.339	.265	1.133	.273

a. Dependent Variable: TWO

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	BARRIER2[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: TWO

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.209[a]	.044	-.006	1.6013

a. Predictors: (Constant), BARRIER2

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.236	1	2.236	.872	.362[a]
	Residual	48.716	19	2.564		
	Total	50.952	20			

a. Predictors: (Constant), BARRIER2

b. Dependent Variable: TWO

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.793	.871		5.501	.000
	BARRIER2	-.248	.266	-.209	-.934	.362

a. Dependent Variable: TWO

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	BARRIER3[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: TWO

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.110[a]	.012	-.040	1.6277

a. Predictors: (Constant), BARRIER3

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.616	1	.616	.233	.635[a]
	Residual	50.336	19	2.649		
	Total	50.952	20			

a. Predictors: (Constant), BARRIER3

b. Dependent Variable: TWO

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.388	.791		5.548	.000
	BARRIER3	-.110	.228	-.110	-.482	.635

a. Dependent Variable: TWO